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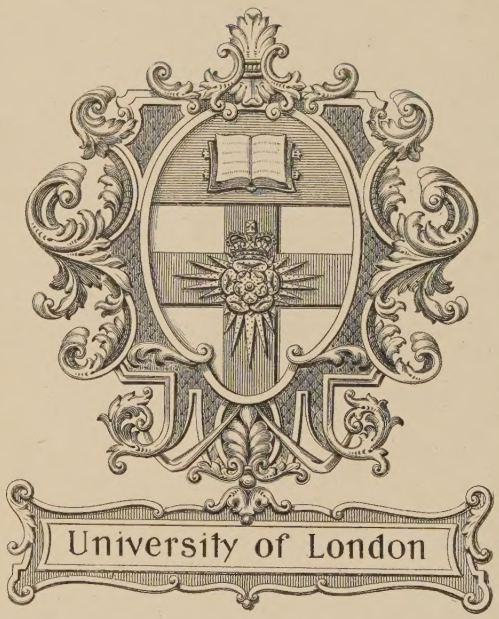

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REPORTS

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(19.)—Part I.

PARIS UNIVERSAL EXHIBITION.

Session

31 *January*—— 29 *July* 1856.

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REPORTS, PAPERS, &c.
1856.

CONTENTS OF THIS VOLUME.

NOTE.— *The* FIGURE *placed at the* END OF THE LINE *refers to the Manuscript Paging of the Volume as arranged for the House.*

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VOL. XXXVI Part I

REPORTS

ON THE

PARIS UNIVERSAL EXHIBITION;

PART I.

Presented to both Houses of Parliament by Command of Her Majesty.

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1856.

049 I

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REPORTS.

REPORT on the MANAGEMENT of the BRITISH PORTION of the PARIS UNIVERSAL EXHIBITION.—By HENRY COLE, C.B.

MR. COLE ON THE GENERAL MANAGEMENT.

To the Right Hon. the Lord Stanley of Alderley, President of the Lords of the Committee of Privy Council for Trade, &c., &c., &c.

Marlborough House, London,
12th February 1856.

MY LORD,

1. HAVING been directed, on the part of the Lords of the Committee of Privy Council for Trade, to superintend the management of the British portion of the Paris Universal Exhibition, I have now the honour to lay before your Lordship an account of the proceedings, so far as they concern that section of the Exhibition.

2. When this has been done, I propose to submit for consideration some remarks on the policy and extent of any Government interference in such exhibitions, and on the appointment of Juries, in the hope that my observations may be found useful in any future Exhibitions which may take place.

Principles of management of the Paris contrasted with those of the London Exhibition

3. The principles on which the French Government conducted the Paris Exhibition of 1855 resembled for the most part those of the London Exhibition of 1851. The chief differences consisted in the admission of pictures and engravings, which were prohibited in London; in the adoption of a special Customs' tariff of 20 per cent. *ad valorem* on all articles which were prohibited either absolutely or partially by the ordinary French tariff, a measure necessary in the case of France, or there could have been no exhibition, but not required in the London Exhibition; in the permission given to exhibitors to mark prices on articles exhibited, which was not granted in London; and in the award of prizes to foremen of works, workmen, &c., who were not direct exhibitors.

4. The whole cost of the central management of the Exhibition was borne by the French Government, whereas the risk of the London Exhibition was undertaken by a voluntary association of individuals in their private capacity, and was in no respect shared by the Government, which only gave a sanction to the undertaking and named a commission to communicate with foreign countries. The

Mr. Cole on the General Management.

Appointment of an Imperial Commission.

Government guarantee to a company.

management in Paris was confided to a special commission appointed by the Emperor, but their powers appeared to have been somewhat controlled by a private company who were owners of the *Palais de l'Industrie* in the Champs Elysées. This was the principal building used for the Exhibition, which had been erected at a cost exceeding half a million of pounds sterling, upon a guarantee from the Government of 4 per cent., together with a share in any contingent profits. These contingent profits, which did not arise, constituted the company the actual receivers of the fees for admission, and they made certain regulations of their own, of doubtful convenience to the success of the Exhibition. The regulations made by the Imperial Commission for the management of the Exhibition are appended to this Report. (See p. 33.) The administration of them was directed by His Imperial Highness the Prince Napoleon, the President, who always acted with a liberality, which greatly facilitated the duties of the British Commission. (See p. 53.)

Assistance afforded by the British Government.

5. As it appeared to the British Government to be very doubtful if voluntary association and private enterprise would produce an adequate representation of British art and industry in Paris, corresponding to the efforts which the French Government had made in 1851, estimates for aiding the formation of a proper Exhibition were submitted to Parliament, and a sum of 50,000*l.* voted to be administered under the responsibility of the Board of Trade. This estimate, with its details, together with the Minutes of the Treasury and the Board of Trade, regulating the control of it, and appointing the chief officers, are given. (See Appendix C., pp. 54, 57.)

Parliamentary vote of 50,000*l.*

6. The names of the officers acting in Paris on behalf of the Board of Trade and of the Commissioners appointed by the Colonies, and agents for the exhibitors, are also appended. (See p. 58.) Besides these officers, the Board of Trade requested various noblemen and gentlemen to act as Jurors in the several classes into which the Exhibition was divided; their names and the classes in which they gave their services gratuitously will be found in the Appendix (p. 60.)

7. In obtaining British exhibitors, and adapting their demands to the space afforded by the Imperial Commission, it was a ruling principle to invite the co-operation of voluntary associations of the country representing Science, Art, and Industry, and to induce them to take an active part in the work of organization. Entire success attended this course. The Royal Agricultural Society charged themselves with superintending the exhibition of agricultural machinery;

Assistance of public associations.

the Council of the Institution of Civil Engineers, that of machinery in general, whilst the Royal Society superintended that of scientific and philosophical instruments.

8. Local committees for the representation of manufactures were formed at Aberdeen; Arbroath; Belfast; Birmingham; Bradford; Bristol; Derby; Dublin; Dudley; Dundee; Dunfermline; Edinburgh; Glasgow; Huddersfield; Leeds; Macclesfield; Manchester; Nottingham; Paisley; Preston; Sheffield; Staffordshire Potteries; Sunderland; Trowbridge; Walsall; and Wolverhampton. Whilst, in the metropolis, committees were formed for the trades of,—Bookbinders; Boot and Shoe Makers; Brush Makers, Comb Makers, and Turners; Cabinet Makers, and Decorators in Relief; Carpet Makers; Carriage Builders; Chemists, Clock and Watch Makers; Copper-plate, Lithographic, and Anastatic Printers; Furriers; General Metal Workers; Goldsmiths and Silversmiths; Hat and Cap Manufacturers; Letter-press and Surface Printers, and Type Founders; Musical Instrument Makers; Paper Makers and Stationers; Paper Stainers and Surface Decorators; Philosophical Instrument Makers; Rope, Twine, Canvas, and Matting Makers; Saddlers, and Harness Makers; Shawl and Mixed Fabric Manufacturers; Silk Trade; Tailors and Clothiers; Tanners, Curriers, and Leather Dressers.

Local Committees formed.

Metropolitan trade committees.

9. A very small proportion of the exhibitors acted independently of committees, and there were but few cases in which the Government itself appeared as a direct exhibitor. The instruments and maps of the Ordnance Survey; the Geological Survey; a full-sized model of the Transit Circle used at Greenwich Observatory; a collection of the apparatus and diagrams used for instruction in Science and Art; a collection of the varieties of Coal obtained in the United Kingdom; and a collection of Agricultural Produce, the chief part of which was procured with the valuable assistance of Messrs. Lawson, of Edinburgh, constituted the contributions of the Government to the Industrial Division.

Objects exhibited by the Government.

10. As a whole, the British section, although necessarily much less in quantity, more completely represented the productions of the United Kingdom and its Colonies, than the Exhibition of 1851. The comprehensiveness of the Colonial collections left little to be desired, and they promise to be of great mutual benefit to the Colonies and the mother country. The British Colonies which sent collections of their produce to the Exhibition were the Bahamas, Barbadoes, British Guiana, Canada, Cape of Good Hope, Ceylon, the East Indies, Jamaica, Mauritius, New South Wales (Sydney), New Zealand, Van Diemen's Land, and Victoria (Melbourne). The productions sent from British Guiana, Canada, the

Character of the British productions exhibited.

Mr. Cole on the General Management.

East Indies, and South Australia were, in some respects, more useful and complete than those which were sent to the London Exhibition. The quality of the Machinery displayed was very good, but owing to the employment of some of the principal machine makers in preparations for the war, several important kinds of machinery were not represented; and curious as the fact is, perhaps, the weakest part of the British portion, considering the real position of its producers with those of the rest of Europe, was the machinery. The principal seats of Manufactures were thoroughly well represented, except Leeds, Birmingham, and Belfast; Manchester appeared much more completely represented than in 1851, and its display attracted great attention. Glasgow and Bradford, Sheffield and the Potteries, were thoroughly represented. Nottingham showed well, although not so extensively as might have been wished. Kidderminster well. The Glass trade was but partially represented; the Furniture, almost wholly from London, was excellent, but not great in quantity; the Musical Instruments consisted only of a single organ, and a few pianofortes; Civil Engineering was abundantly illustrated by the best models of the chief works of recent times. The three principal goldsmiths and jewellers made a full display; but the exhibition of watches and clocks and philosophical instruments was less complete than it might have been, several of the chief producers not having exhibited at all.

Reception and arrangement of the goods.

11. An account of the shipping of the British goods (well conducted by Messrs. Lightly and Simon), their reception in Paris, their arrangement in the several buildings, and the difficulties attending this duty, the space occupied, the causes of delay, the value of the exhibits, and of all other matters of this nature, has been prepared by Mr. Richard Thompson, the general superintendent of arrangement, and is printed. (See p. 89.)

Catalogue.

12. The names of the British exhibitors, and their productions, were published in an English and French catalogue, illustrated by notes on the industry of the United Kingdom, which excited considerable interest in France.*

British reports by Chambers of Commerce and Jurors, &c.

13. The relative position which the productions of the United Kingdom were considered to hold in comparison with those of other nations exhibiting on this occasion, the progress which has been made since 1851, and the necessity for improved industrial education in the United Kingdom will be found treated of in several reports prepared by deputations from various Chambers of Commerce, and by Jurors and others.

* Published by Messrs. Chapman and Hall, 193, Piccadilly, London, and sold in the Palais de l'Industrie, by permission of the Imperial Commission.

14. The Chambers of Commerce which have published such reports are—Belfast, Bradford, Huddersfield, Leeds, and Liverpool. (See pp. 109–178.)

15. The Jurors and others who have engaged to furnish reports on various classes of the Exhibition are,—

On Mining and Minerals, Professor Warington Smyth.
*On Agriculture, Mr. J. Evelyn Denison, M.P.
On Vegetable Produce, Sir Wm. Hooker.
On Machinery in general and Iron, Mr. Fairbairn.
*On Carriages and Harness, Lord Shelburne, M.P.
On Machinery for Woven Fabrics, Professor Willis and the Chambers of Commerce of Leeds and Huddersfield.
On Philosophical Instruments, Sir David Brewster.
On Heat, Light, and Electricity, Professor Wheatstone and Dr. Arnott.
On Chemical Manufactures, Dr. Hofmann and Mr. W. De la Rue.
*On Alimentary Substances, &c., Professor Owen and Dr. Royle.
*On Military Arts, &c., Captain Fowke, R.E.
*On General Metal Work, Mr. G. Wallis and Mr. A. Tylor.
On Pottery, Mr. Arnoux (with Messrs. Mintons').
On Glass, Mr. Bontemps (late with Messrs. Chance).
*On Cotton and other Imports, The Liverpool Chamber of Commerce.
*On Woollen and Worsted Goods, and their Machinery. The Leeds, Bradford, and Huddersfield Chambers of Commerce.
*On Silk, Mr. Winkworth.
*On Linens, The Belfast Chamber of Commerce.
*On Furniture and Decorations, Mr. M. Digby Wyatt.
*On Printing, Mr. C. Knight.
On Design in Manufactures, Mr. R. Redgrave, R.A.

Statistics.

16. The number of exhibitors in the industrial branch who finally exhibited was 1,555 from the United Kingdom, and about 1,070 from the British Colonies.† The

* These Reports are printed in this volume. The others will appear in a second part.

† Analysis of the Number of Exhibitors.—Fifty-three foreign states and twenty-two foreign colonies took part in the Universal Exhibition of 1855, in addition to France herself, the three Algerian provinces, and eight French colonies.

The first edition of the Catalogue, published on the 12th of May, contained the names of 16,944 exhibitors, viz., 8,968 from the French Empire, and 7,976 from foreign countries. In the last edition of the Catalogue, after deducting the names of 765 exhibitors which appeared in the first edition, and who did not send their contributions, the number of exhibitors amounts to 20,839, viz., 10,691 from the French Empire, and 10,148 from foreign states, and were divided in the following proportions:—France had 9,790; Algeria, 724; and the French colonies, 177; total, 10,691. The Duchy of Anhalt had 15; the Argentine Confederation, 6; Austria, 1,296; Grand Duchy of Baden, 88; Bavaria, 172; Belgium, 686; Brazil, 4; Duchy of Brunswick, 16;

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number of British exhibitors who demanded space and did not exhibit, was 124. The value of the goods sent to the Exhibition was 173,441*l.*, exclusive of the goldsmiths' and jewellers' work, which was estimated at 520,186*l.** The number of packages sent was 6,420 ; the weight, 1,303 tons, 6 cwt. 25 lbs. The number returned to England was 3,978, and the weight was 764 tons, 8 cwt. 3 qrs. 22 lbs.

Commercial results.

17. With the view of ascertaining if the Exhibition had been considered by those who had contributed to it productive of commercial or other advantages, inquiries were made of a few of the principal exhibitors, in reply to which it appeared that the sales of goods exhibited had been in general remunerative. This was chiefly apparent in the case of articles of strictly British manufacture, which had hitherto been absolutely prohibited, such as earthenware, woollen, cotton, steel, and other manufactures, or excluded from France by the high duties levied upon them, but which, on this occasion, had been reduced to 20 per cent. *ad valorem.* The advantages in the formation of new connexions to be derived from an exhibition, must be prospective in a great degree, and many exhibitors appear to anticipate future benefit from the steps which they took during the Exhibition to establish them, especially if modifications of the French tariff should continue to be made, and actual prohibition removed, as is confidently expected in the present French Session. During the Exhibition reductions were made in the duties on machinery and metals, and since the Exhibition, modifications have been made in the duties on wool and worsted. Other reductions are in progress, and a statement of all will be furnished in the Second Part of these Reports. Mr. Evelyn Denison has pointed out that the important reduction of the tariff made during the Exhibition in favour of agricultural implements is due to the representations of the Jury on Agriculture. (See p. 191.)

Reductions in the tariff.

Republic of Costa Rica, 4 ; Denmark, 90 ; St. Domingo, 1 ; Egypt, 6 ; Frankfort-on-the-Main, 24 ; Great Britain and Ireland, 1,589 ; British colonies, 985; Greece, 131 ; Republic of Guatemala, 7 ; Kingdom of Hanover, 18 ; Hanse Towns, 89 ; Grand Duchy of Hesse, 74 ; Electorate of Hesse, 14 ; Principality of Lippe-Detmold, 2 ; Grand Duchy of Luxemburg, 23; Mexico, 107; Duchy of Nassau, 59 ; Netherlands, 411 ; New Granada, 13 ; Grand Duchy of Oldenburg, 13; Ottoman Empire, 2 ; Sandwich Islands, 5; Papal States, 71 ; Portugal (including colonies), 443; Prussia, 1,313; Principalities of Reuss (Elder and Younger Branches), 2 ; Sardinia, 198; Saxony, 96 ; Duchy of Saxe-Altenburg, 2 ; Duchy of Saxe-Coburg, 6 ; Duchy of Saxe-Coburg-Gotha, 11 ; Duchy of Saxe-Meiningen, 3 ; Grand Duchy of Saxe-Weimar, 1 ; Principality of Schaumburg-Lippe, 2 ; Principality of Schwarzburg-Rudolstadt, 1 ; Spain, 568 ; Sweden and Norway, 538 ; Switzerland, 408 ; Grand Duchy of Tuscany, 197 ; Tunis, 1 ; United States, 130 ; Wurtemburg, 207 ;—total, 10,148. These figures are taken from the French Catalogue.

* This estimate is exclusive of the Fine Arts, valued at 137,560*l.*

18. The Fine Arts portion of the British Exhibition excited great attention in Paris. Undoubtedly it was a complete display of the state of the Fine Arts of the United Kingdom. Mr. Redgrave, who had the superintendence of it, has prepared a separate report, which renders further allusion to this portion of the exhibition unnecessary. (See p. 73.)

Report on Fine arts.

19. The Exhibition opened on the 15th of May, and the concluding ceremony took place, with great success and punctuality, on the 15th of November, owing to the excellent arrangements of M. Le Play, the Commissioner General. The clearance of the goods commenced immediately afterwards, and continued, although the public were admitted up to 1st of Dec. to concerts given in the *Palais de l'Industrie*, and to other portions of the buildings.

Opening.

20. The total number of visits to the Paris Exhibition, was 4,533,464 ;* 3,626,934 visits were made to the Industrial Section, and 906,530 visits to that of the Fine Arts. Forty thousand British subjects visited the Paris Exhibition, of whom, 2,768 were persons who obtained workmen's passports from the Foreign Office without payment.

Number of visits.

21. Her Majesty the Queen, His Royal Highness Prince Albert, the Prince of Wales, and the Princess Royal paid several visits to the various departments of the Exhibition in the month of August.

22. The scale of fees charged for admission to the Palais de l'Industrie, and to the Palais des Beaux Arts respectively was as follows:—

Entrance fees.

At the opening of the Exhibition, (15th of May 1855,)
Sunday,† - - - - 20 centimes, (2*d.*)
Monday, Tuesday, Wednesday,
Thursday and Saturday, - 1 franc, (10*d.*)
Friday, - - - - - 5 francs, (4*s.*)

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* The total number of visitors to the London Exhibition of 1851 was 6,039,195.

† On Sunday the 27th of May the Exhibition Buildings were thrown open to the public gratuitously.

On the 3rd of August the admission fees were altered as follows:—

Monday - - - - - 20 centimes (2*d.*)
Tuesday, Wednesday, Thursday, Saturday, and Sunday } 1 franc (10*d.*)
Friday - - - - - 2 francs (1*s.* 8*d.*)

On the 11th of August the admission fees were again changed as follows, this final modification being maintained until the close of the Exhibition, on the 15th November:—

Sunday - - - - - 20 centimes (2*d.*)
Monday, Tuesday, Wednesday, Thursday, and Saturday } 1 franc (10*d.*)
Friday - - - - - 2 francs (1*s.* 8*d.*)

The price of season tickets was 50 francs (40*s.*), for each of the Exhibitions. The holder of them was entitled to admission every day, as well as to the opening ceremony.

Mr. Cole on the General Management.

Receipts.

It was a novelty to have such charges for an exhibition in France, and may be considered to have been proved successful. The receipts were 2,941,668 francs, a sum equal to 117,666*l.* 15*s.* The receipts at the London Exhibition amounted to 356,808*l.* 2*s.*, but the scale of admission was higher, and the lowest fee taken 1*s.* A statement of the expenditure has not yet been published, but I have been informed by a high authority, that it will exceed 500,000*l.* exclusive of the cost of the Palais de l'Industrie, which was above 500,000*l.* As this building will have to be purchased by the Government, the total cost will have exceeded a million of pounds sterling.

Cost of the British assistance.

23. The work of the British portion will be brought to a conclusion, with an expenditure not exceeding 40,000*l.*, being 20 per cent. less than the sum voted in Parliament. Since the great commercial success of the Exhibition of 1851, there have been Exhibitions at Dublin, New York, and the Crystal Palace in London, in all of which the estimates have been largely exceeded, but in the present case, as far as the action of the British Government is concerned, as with the Exhibition of 1851, the satisfactory state of the balance sheet is greatly due to a steady maintenance of the self-supporting principle by which the efforts of exhibitors were aided, but not weakened, and to their having been encouraged to do their own work as much as possible.*

24. I proceed now to submit to your Lordships some considerations—

On the Policy and Extent of Government Interference in future Industrial Exhibitions.

Future Industrial Exhibitions.

25. The utility of the London and Paris Universal Exhibitions in teaching nations the comparative strength and weakness of their respective industries, and showing their mutual means for supplying each others wants; in dissipating the prejudices of ignorance, and awakening desires for improvement, has been so manifest and generally admitted, that, notwithstanding the cost and trouble of them, and the great interruption they cause to ordinary trade, it is probable these Exhibitions will extend and become periodical, at least in some of the principal capitals of Europe. Before the Paris Exhibition had closed, it was rumoured, with some appearance of authenticity, that the next Universal Exhibition would take place at Vienna, in 1859; and preparations were also discussed for holding such Exhibitions at Berlin and Turin.

* Even had the estimates been exceeded, in the present case, perhaps, some excuse might have found in far the greater excess of bulk, weight, and quantity of the goods sent for exhibition than the estimates provided for.

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26. It seems desirable, therefore, to inquire whether the principles on which the British Section of the Paris Exhibition was organized and conducted are applicable to future Exhibitions in which the United Kingdom may be invited to take a part, or are to be regarded as exceptional merely to the Paris Exhibition.

Extension of commerce the inducement to exhibit.

27. The ultimate purpose of all Industrial Exhibitions is commercial. It is true that various motives, besides those of direct trade, induce some few exhibitors to display their productions, but the bulk of exhibitors will be always attracted by the hopes of extending commerce.

28. It is also true that a great feature of the London Exhibition was its comprehensiveness, embracing, as it did, the display by foreign exhibitors of numerous classes of objects not directly matters of general commercial interest, —such as the Queen of Spain's jewels, the Austrian furniture, the malachite of Prince Demidoff, &c. Such objects were more rare in the Paris Exhibition. There was no royal jewellery from Spain; malachite from Russia could hardly be expected. There was very little costly Austrian furniture, but an increased quantity of Austrian cloth. The tendency of future Exhibitions, in their foreign departments, will be to exhibit not rare and costly productions, required by very few purchasers, but manufactures; and especially those manufactures the use of which is universal, and not merely national or peculiar.

Exhibitions will become international fairs.

29. Exhibitions will therefore lose in completeness, but gain in utility. Nations by this means, will learn how each one may best exchange with the other the productions in which they naturally excel, and these Exhibitions will become international fairs. Thus, England is likely in any future Universal Exhibition to send more cotton and woollen goods than furniture or stained glass, more common earthenware than decorated porcelain, and more tools and cutlery than polished steel grates.

30. The French Government, looking to the commercial utility of the Paris Exhibition, introduced for the first time an exceptional Customs' tariff of 20 per cent. *ad valorem* in favour of all goods exhibited, and took every means, short of compulsion, to induce exhibitors to affix prices to their goods.

Liberality of the French authorities in permitting sales.

31. The Imperial Commission, the French Customs, and the French Government, all behaved most liberally in admitting large quantities of British goods to the Exhibition, which were not very necessary to it, but which were allowed to enter to oblige exhibitors and to gratify the

Mr. Colt on the General Management.

desires of the French purchaser, who eagerly sought to make the Exhibition the channel for obtaining those things which were otherwise prohibited. Of course, British manufacturers were not backward to avail themselves of these concessions, and were only too eager to supply any quantity of pottery, alpacas, woollen cloths, cotton goods, agricultural machinery, &c., which the French consumer would purchase.* Even the large quantity sent, supplied but a very limited amount of the orders (especially for prohibited articles of the cheapest kind) which were given by all classes, from the lowest to the very highest, in France. Large purchases of earthenware were made. The delicate cotton quiltings of Manchester and cotton fustians attracted great notice, even from the nobility of France, and all the population of Paris seemed willing to clothe themselves in black alpacas. But many more orders were refused than executed.

32. My instructions from the Board of Trade being to limit the admission of British articles, as far as possible, to the real object of the Exhibition, the payment of the transport of articles at the cost of the public was stopped soon after the opening of the Exhibition; but the French people were urgent to buy, the British producer was not unwilling to sell, and the Imperial Commission relaxed their rules in the most lenient way, although British traders still thought them too stringent. It is almost needless to add, that, having to stand at least neutral between buyer and seller, both eager for action, the position of the British authorities was difficult, and, to say the least, unusual for officers of the British Government to be placed in.

A future French Exhibition would overflow with manufactures in general demand.

33. A second Universal French Exhibition, conducted under the same rules as the last, would be very different. The British producers, made wise by experience, would send chiefly, if not wholly, those manufactures which were likely to sell at the close of the Exhibition, such as cotton goods, cloths, flannels, pottery, machinery, &c. They would pile up the space allotted to them in the building, from the floor as high as the authorities would allow them, and no authority could practically control the extent of transmission without preventing the Exhibition altogether.

* Upwards of 296 crates of pottery, weighing 58 tons, were introduced into the Exhibition after its opening; and 100 crates, weighing about 15 tons, were admitted by the French Government even after the close of the Exhibition. The Manchester Committee, keeping the object of the Exhibition strictly in view, preferred rather to discourage than permit sales of cotton goods. The Bradford exhibitors thought a wide distribution of alpacas among the French would be most useful to both parties.

34. Thus, the Exhibition would be overflowing with certain kinds of goods, and destitute of others, unless a moderate Customs' tariff were made a permanent law, and not adopted for the occasion. Then exhibitors would send samples, and take orders, and the Exhibition would be carried out strictly as an Exhibition and not as a fair. The relations therefore should be settled directly between the two parties—the foreign Government which invites the Exhibition for the benefit of its people, and the exhibitor who accepts the invitation for his own honour and profit.

The inducement to exhibit only the most saleable articles increased by the distance of the Exhibition.

35. If such are likely to be the future results, under a prohibitory or a special temporary tariff, in France, the nearest neighbour to England, they would be still more exaggerated at a greater distance. For example, at Vienna, a Universal Exhibition, in which British industry should be adequately represented, must be nearly, if not quite, a failure, unless one of two courses were adopted. It would either be for the Austrian Government to furnish adequate motives to exhibitors, so that the British action might be voluntary; or, for the British Government to purchase specimens of manufactues, and exhibit them on its own responsibility, a course that would hardly seem to be feasible.

Non-interference of the Government in the London Exhibition.

36. It is not likely that such an interference with commerce as this would be supported by public opinion in England. Even the interposition of Government in the management of the Paris Exhibition was the reverse of its course with the London Exhibition, where the voluntary principle was carried so far, that the expenses of the Police and the Sappers were not defrayed out of the public Exchequer, but out of the funds of the Exhibition. The partial interference in the Paris Exhibition, I submit, can only be justified as exceptional, and should not be treated as a precedent for future Exhibitions.

37. But it may be said that Austria and the various Governments of Europe courteously assisted in the London Universal Exhibition, and the question may be asked, Can the British Government decline the invitations of other Governments in future? The answer would seem to be, Certainly not; provided the circumstances under which a foreign Exhibition is invited are the same as those under which the British Exhibition took place. There, however, is this material difference, that foreign exhibitors were invited in 1851, having a full knowledge of their chances of future commerce under a free trade. Therefore, until foreign tariffs are placed on the same footing as the tariff of the United Kingdom, every application for the assistance of the

Mr. Cole on the General Management.

British Government in a foreign Exhibition may fairly be dealt with on its own merits.

38. It would seem, however, to be far better to have some general principles for the future, regulating the nature of the assistance to be given on the part of Government, and the course to be followed in managing foreign Exhibitions, which should be as self-acting as possible, and consistent with the ordinary practice pursued by Government in commercial matters; and I will endeavour to submit such principles to your Lordship's consideration.

39. It is admitted to be a maxim of sound politics, at least in England, that Government should do only those things for public advantage which the public is unable to do for itself, and that the less it interferes in trade, so essentially regulated by private enterprise and intelligence, the better. The least possible interference with all future Universal Exhibitions would be most in accordance with the usual Government action and public opinion in England. And in truth, very little interference would be necessary for success, if foreign Governments held out adequate inducements to producers to exhibit. The function of Government would then be limited to receiving the invitation of the foreign Government, organizing preliminary measures, and reporting the results of them to the Government issuing it.

Interference unnecessary if the inducements to exhibit are adequate.

40. It may be useful to enter somewhat into detail as to the course which might be followed, using the experience which has been obtained in the Paris Exhibition.

41. It may be laid down as an axiom, that the chief and direct advantages of an Exhibition are derived by the country which holds it. It cannot be doubted that England with its Exhibition of 1851 and France with its Exhibition of 1855 respectively derived a much greater proportionate benefit than any of their foreign contributors. In the case of the English Exhibition, besides the stimulus to trade, an immense impulse to industrial improvement was originated by the Exhibition, the effects of which are only beginning to be felt. London reaped a large harvest from visitors to the metropolis.* So indeed has Paris during its Exhibition. It is stated that nearly 160,000 foreigners visited Paris, upwards of 40,000 being British subjects, as I am informed by M. Pietri, the Commissioner of Police, being more than two thirds of the number of all foreigners that visited London. The police returns show that upwards

The advantages are on the side of the country holding the Exhibition rather than the foreigner.

* Upwards of 70,000 of these were foreigners. How many came from parts of the United Kingdom is not known.

of 350,000 visitors from the provinces of France came to Paris during the Exhibition, and it would probably be a low estimate to say that an additional sum of 6,000,000*l.* was spent in Paris during the year 1855 by visitors. I may be permitted to mention that a high authority in France is of opinion that the extra expenditure occasioned by the Exhibition more than repaid the great cost itself of the Exhibition, already mentioned as estimated at half a million of pounds sterling, independently of the cost of the principal building exceeding 500,000*l.*, on which an interest of 4 per cent. has been guaranteed by the French Government for several years.

42. It is, therefore, in every point of view the interest of the foreign Government inviting an exhibition to offer the most liberal inducement to exhibitors to exhibit, and especially in respect of British goods, for which foreign productions may be freely exchanged, and imported into the United Kingdom. I consider it necessary that there should be either a permanent tariff as low as that of the United Kingdom, or *an absolute temporary suspension of all Customs' dues on articles exhibited* and sold during the Exhibition. This measure would not be at all too liberal to insure the best exhibition of British goods in the capitals of Germany or Italy.

Absolute suspension of customs dues not too great a bounty for a distant Exhibition.

43. With a rule so simple, it would only be for the foreign Government to offer free carriage of goods and general assistance in the reception of the articles, whilst the preparation of goods and the other expenses would be borne by the exhibitors themselves.

44. In the Paris Exhibition the expenses of many items were borne by the French and British Governments. The French paid the transport of articles from and to the French frontiers, the British Government paid 7,531*l.* 2*s.* 11*d.* for the transport between London and Dunkirk. The French undertook the unloading of the goods in the Exhibition building, and depositing them in their places ; but practically the placing them was performed by the British authorities. (See p. 97.) For promoting the general effect of the Exhibition, and towards its general maintenance, upwards of 7,000*l.* were applied out of the Parliamentary vote.

Transport.

45. In proportion as all these and the like expenses are borne by the parties most interested, namely the Exhibitors, the better and more smoothly the work will be done.

46. It is impossible to overstate the desire which the Imperial Commission, and especially its President, the Prince Napoleon, uniformly displayed to render the admi-

Division of authority and responsibility.

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nistration of the Paris Exhibition perfectly acceptable to the Foreign Commissioners; but when three separate interests, each again somewhat subdivided, have to work together, it becomes difficult always to define the relative shares of responsibility, and insure prompt action. If these three interests can be reduced to two, then the action is simplified. In the present Exhibition there was, *first*, the Imperial Commission, with their contractors, being the Company finding the building; the Manutention du Commerce de Paris, and the Customs;—*secondly*, the British Commission, responsible to Board of Trade, and representing both the interests of Government and the exhibitors;—and, *thirdly*, the British exhibitors, who, as taxpayers, felt that they ought to have a voice in the expenditure of a Parliamentary vote made on their behalf.

Assistance of foreign Governments is a bounty on high tariffs.

47. Moreover, the more the British Government assists, the less are the motives on the side of the foreign Government to offer liberal inducements to the exhibitors; and the conclusion I have been led to form is, that henceforth the soundest policy for the best interests of all parties, in any future Universal Exhibitions, will be to leave the entire management of them to the Government inviting the Exhibition and the foreign exhibitors.

48. The function of the British Government would be to publish the invitation of the foreign Government, and organize the exhibitors into action; and afterwards to abstain from taking any active part in the management, or be responsible for the success of the Exhibition. It should make this resolution, if adopted, fully known.

49. This course would be only a further development of that followed in the Paris Exhibition, where every effort was made to leave the execution of the work in the hands of the exhibitors. The action of the British Government did not comprehend any responsibility whatever over the property of the Industrial exhibitors, either during transit, or arrangement, or any agency in the Exhibition or for sale; whereas in Prussia, Austria, Bavaria, Spain, Portugal, and other foreign Departments, the duties of actual arrangement and sale were performed or superintended by the respective Commissioners.

United States;

50. It should be pointed out that the Government of the United States took no part whatever in the Paris Exhibition. The American Constitution never contemplated any united action of its States for International Exhibitions, and it seems that it cannot be effected. The National Institute at Washington acted as a centre of union in 1851, but no such

organization seems to have been provided in 1855; the result, however, was, that there was little or nothing exhibited direct from America, and, in fact, there was little commercial motive on its part to exhibit its productions.

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51. The fact that the Canadian, Australian, and other Colonial Governments undertook the entire responsibility of their respective displays, making direct purchases for exhibition, conducting the sale, &c., does not affect the question of the interference of the Government of the United Kingdom. The East Indian Government acted in like manner. Indeed, had the management of the Colonial exhibitions depended upon the exhibitors' sense of their own interests, there is no doubt that the Exhibitions would not have taken place,* or have been very insignificant, whereas they were complete.

and British Colonial Exhibitions in Paris.

52. But the commercial instinct of the producers of the United Kingdom is adequate to provide for their own interest. The best course of action for the United Kingdom would not suit the East Indian possessions, or that for the East Indies prove the best for Australia. It therefore becomes impossible to lay down any absolute principle of Government interference in Industrial Exhibitions applicable to *all* countries, on the contrary, each one must be treated according to its peculiar circumstances.

Policy of naming Juries.

53. Should the Government decide to take no part in the actual management of future Exhibitions, still it may be requested to name British Jurors. Its consent to do so, I submit, is a point open at least to grave doubt.

54. The decision of your Lordship that neither Mr. Redgrave nor myself should act as Jurors, or take any part in their proceedings, enabled me to watch the working of the juries dispassionately, and I beg leave to lay before you the conclusions I have formed on the subject.

55. First arises the question of expediency of juries, and next their practicability in any Universal Exhibition. The institution of a jury in such Exhibitions is based upon the assumption that the public is unable to discover merit and to judge rightly for itself, but wants the assistance of an

Expediency of juries considered.

* This happened with Malta, which exhibited well in 1851, and not at all in 1855. The Governor, Sir William Reid, did his best to induce the Maltese producers to exhibit, but without effect. The commercial results of their exhibition in 1851 were not sufficiently satisfactory.

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authoritative judgment. Is this assumption, in the present state of public intelligence, founded on facts? Do the judgments of these juries do anything more than affirm the judgments already made by the public? A glance at the names of those who have received the Grandes Médailles d'Honneur will show that they do not. Among the 138 recipients, is there one who is now revealed for the first time to the public? I venture to think not one. The judgment therefore merely *follows* and confirms public opinion to a certain extent, but in so far as serious omissions are made, and they are many, it is absolutely in this respect in arrear with public opinion, and becomes unjust.

The public will not surrender the right of private judgment.

56. Even conceding the point that the public at large do not judge rightly for themselves, it cannot be affirmed that they are willing to surrender their right of judgment, and be led by any jury in this question of buying and selling,—the most common-place business of every day,—upon which everyone is practically the absolute and irresponsible judge. It would seem at the present time that private judgment, at least in the United Kingdom, hesitates to submit itself to authority in forming opinions on subjects of more vital importance than the quality of a cotton print, or a piece of pottery, or the beauty of a picture. The very terms "civil and religious liberty" show that the spirit of the times is not to bow, even in political or religious faith, to the verdict of any human tribunal.

57. Authoritative judges in investigating discoveries and experiments, in which the world has little or no experience to guide it, may be, and often are, useful. But the principle of juries in Industrial Exhibitions hitherto has not been thus limited. On the contrary, juries in Universal Exhibitions are called upon to investigate the most trifling of details, and determine the relative merits as well of a discovery in electro-magnetism as the make of a lady's corset; while the fact is, that every one assumes the right, and exercises it, of judging for himself what articles he shall purchase for his subsistence or enjoyment.

Juries, if expedient, are impracticable in working.

58. But should it be granted that the principle of juries in an Exhibition is expedient, the experience of their working is conclusive that they are impracticable means for arriving at impartial, comprehensive, and correct judgments.

59. I hope it will not be inferred that these remarks arise from any feeling that injustice was done to British productions on the late Exhibition. On the contrary, I am led to believe that, compared with other foreigners, more than ample justice was done to our exhibitors, and that if

any complaint were to be made in the *general* interest, it would be that British exhibitors received too many rewards.

60. The theory of the judgments given in an Universal Exhibition is that all countries are treated alike, and the best works are eliminated for reward, without respect to country; but the steps taken do not insure this result. On the contrary, the estimation of the goods of each country is ultimately determined very much in proportion to the number of its Jurors.

Judgments depend on the numbers of jurors assigned to a nation.

61. In the Paris Exhibition, as at London, juries generally of thirteen persons were named for each class; half the number of each jury being named by France, and half by foreign Governments, each foreign country obtaining a number somewhat proportioned to its number of exhibitors. But this seemingly impartial division of numbers is fallacious in preventing a national, or in insuring an international judgment.*

Action of juries in Paris.

* As many as fifty-nine Jurors, including those for the Fine Arts, were thus allotted to England, and consequently it was possible to name one or more Jurors on every one of the thirty classes, an arrangement which insured, in some degree, a more or less complete recognition of all kinds of British productions. Hardly any other foreign country received a number of Jurors equal to the number of classes, and some had only two or three Jurors in all.

The total number of Jurors was 398 :—The number assigned to France, 208; the number assigned to Foreign Countries, 190; in the following proportions :—

Class I. Mining and Metallurgical Products.—Austria, 2; Belgium, 2; British Colonies, 1; Great Britain, 2; France, 5; Prussia, 1.—Total, 13.

Class II. Forestry, Hunting, Shooting, and Fishing, and Products obtained without Cultivation.—Great Britain, 1; France, 8; Portugal, 1; Tuscany, 1; United States, 1.—Total 12.

Class III. Agriculture.—Austria, 2; Grand Duchy of Baden, 1; Belgium, 2; Denmark, 1; France, 9; Great Britain, 3; Spain, 1; Sweden and Norway, 1. —Total, 20.

Class IV. Machinery in general, as applied to Industry.—France, 6; Great Britain, 1; Portugal, 1; Spain, 1.—Total, 9.

Class V. Special Machinery and Apparatus for Railways and other Modes of Transport.—Belgium, 2; France. 5; Great Britain, 2; Prussia, 1.—Total, 10.

Class VI. Special Machinery and Apparatus for Workshops.—Austria, 1; France, 7; Great Britain, 1; Prussia, 1; Sardinia, 1; Sweden and Norway, 1; Tuscany, 1.—Total, 13.

Class VII. Special Machinery and Apparatus for the Manufacture of Woven Fabrics.—Austria, 1; France, 5; Great Britain, 1; Spain, 1; United States, 1. Total, 9.

Class VIII. Arts relating to the Exact Sciences, and to Instruction.—Bavaria, 1; France, 6; Great Britain, 3; Prussia, 1; Switzerland, 2.—Total, 13.

Class IX. Manufactures relating to the Economical Production and Employment of Heat, Light, and Electricity.—Austria, 1; France, 5; Great Britain, 2; Prussia, 1.—Total, 9.

Class X. Chemical Manufactures, Dyeing and Printing, Paper, Leather, Skins, India-rubber, &c.—Austria, 1; Belgium, 1; France, 9; Great Britain, 2; Grand Duchy of Hesse, 1; Portugal, 1; Prussia, 2; Switzerland, 1. —Total, 18.

Class XI. Preparation and Preservation of Alimentary Substances.—

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62. The juries were summoned to assemble on the 15th June, and the greater part of them met, and proceeded to organize themselves for working, excepting the Fine Arts juries, who were adjourned to the 1st, and again to the 15th, October. However desirable or convenient this adjournment may have been to the French Jurors, who proposed it, it was not equally so to the foreign Fine Arts Jurors, who had come expressly to Paris from all parts of Europe, and some of whom were unable to remain, or return to their duties at a later period.

63. Many of the Industrial juries proceeded to examine the goods in June. Others were unable to do so, because

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Austria, 2; France, 4; Great Britain, 1; Prussia, 1; Wurtemburg, 1.—Total, 9.

Class XII. Hygiene, Pharmacy, Surgery, and Medicine.—France, 7; Great Britain, 3; Netherlands, 1.—Total, 11.

Class XIII. Naval and Military Arts.—Belgium, 2; France, 7; Great Britain, 2; Greece, 1; Prussia, 1.—Total, 13.

Class XIV. Civil Engineering and Building.—France, 9; Great Britain, 2; Turkey and Egypt, 1.—Total, 12.

Class XV. Steel and its Products.—Austria, 1; France, 6; Great Britain, 2; Prussia, 2; Sardinia, 1; Sweden and Norway, 1.—Total, 13.

Class XVI. General Metal Work.—Austria, 1; Belgium, 1; France, 7; Great Britain, 2; Hanover, 1; Wurtemburg, 1.—Total, 13.

Class XVII. Goldsmith's Work, Jewellery and Bronzes.—France, 5; Great Britain, 1; Netherlands, 1; Prussia, 2; Turkey and Egypt, 1.—Total, 10.

Class XVIII. Glass and Pottery.—Austria, 1; Belgium, 1; France, 7; Great Britain, 3; Netherlands, 1; Prussia, 2.—Total, 15.

Class XIX. Cotton Manufactures.—Austria, 2; Belgium, 1; France, 6; Great Britain, 2; Prussia, 1; Switzerland, 2.—Total, 14.

Class XX. Woollen and Worsted Manufactures.—Austria, 3; Belgium, 1; France, 9; Great Britain, 2; Prussia, 3; Saxony, 1; Wurtemburg, 1.—Total, 20.

Class XXI. Silk Manufactures.—Austria, 3; France, 7; Great Britain, 2; Prussia, 1; Switzerland, 1.—Total, 14.

Class XXII. Flax and Hemp Manufactures.—Austria, 1; Belgium, 1; France, 5; Great Britain, 2; Prussia, 1; Wurtemburg, 1.—Total, 11.

Class XXIII. Hosiery, Carpets, Embroidery, Lace of every kind, Gold and Silver Fringe, &c.—Austria, 1; Belgium, 2; France, 9; Frankfort-on-the-Maine, 1; Great Britain, 2; Prussia, 1; Spain, 1; Switzerland, 1.—Total, 18.

Class XXIV. Furniture and Decoration.—Austria, 1; Bavaria, 1; France, 6; Great Britain, 2; Hanse Towns, 1; Mexico, 1.—Total, 12.

Class XXV. Articles of Clothing. Objects of Fashion and Fancy.—Austria, 2; France, 6; Great Britain, 1; Switzerland, 1.—Total, 10.

Class XXVI. Drawing and Modelling applied to Industry, Letterpress and Copper-plate Printing, Photography.—Austria, 1; France, 5; Great Britain, 2; Prussia, 1.—Total, 9.

Class XXVII. Manufacture of Musical Instruments.—Austria, 1; Belgium, 1; France, 4; Great Britain, 1.—Total, 7.

Class XXVIII. Painting, Engraving, and Lithography.—Austria, 1; Grand Duchy of Baden, 1; Bavaria, 1; Belgium, 3; France, 16; Great Britain, 4; Netherlands, 1; Prussia, 2; Spain, 1; Sweden and Norway, 1; Switzerland, 1.—Total, 32.

Class XXIX. Sculpture and Die-Sinking.—Austria, 2; Belgium, 1; France, 11; Great Britain, 3; Papal States, 1; Prussia, 1.—Total, 19.

Class XXX. Architecture.—France, 7; Great Britain, 2 Prussia, 1.—Total, 10.

all the members had not assembled. When the absentees arrived the first comers had departed.* MR. COLE ON THE GENERAL MANAGEMENT.

64. Nearly all of the British Jurors were present at the summons on 15th June, and attended punctually during the months of June, July, and August, when, for the most part, they left Paris, having examined at least the British goods, as well as the circumstances permitted, and agreed with their colleagues upon the decisions.

65. The examination of French articles was continued till the very close of the Exhibition, being rather more active at the close than at the beginning; thus the final decisions assumed a different phase to what they had at the commencement of the work, when the foreign Jurors were present in the greatest numbers. This was, no doubt, unavoidable. It is not to be expected that men of business should neglect their own affairs, to act as *dilettante* judges incessantly for six months,† and it is obvious that the decisions could not fail to be influenced by all kinds of accidents, the fortuitous absence or presence of the Jurors being one of the principal; and even the very residence of the Jurors on the spot becomes a material ingredient in judgments, which take several months to form. The labours of juries too great to be continuous and given gratuitously.

66. The work of a Juror is excessively laborious and irksome. To begin work as early as eight in the morning—to wait for companion Jurors who are not punctual—to pace literally over miles of exhibiting ground—to examine stalls and cases, and meet with no exhibitor or agent present to show or explain them, or to find the glass-case locked and no key producible—to haunt committee-rooms and get no quorum for business,—and to do this day after day is what most of the British Jurors did scrupulously for many weeks, and one at least throughout the whole period of the Exhibition, without missing a single day or a single meeting. But to expect that judgments can be satisfactorily formed with justice by four hundred persons, of all nations, subject to all the difficulties enumerated, virtually irresponsible, Impediments.

* The spring and summer are not opportune periods for insuring the presence of Parisian residents in their metropolis.

† The very duration of the work makes it quite a different thing to the labour which the judges at agricultural meetings, botanical shows, &c. are willing to perform. What may be possible, if done under vigilant supervision and concentrated responsibility, in a short period of two or three days, is impossible if extended *ad libitum* over months. At a cattle show, or trial of agricultural instruments, judges and exhibitors are both present, and prompt to do the work at once; but in an Industrial Exhibition the examinations are in all respects very much a matter of chance. Mr. B. Gibbs has furnished me with a statement of the methodic proceedings adopted with the Judges for agricultural shows. (*See* Appendix, p. 72.)

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liable to numerous accidents beyond control, and impeded somewhat by the difficulties of language, in an Universal Exhibition, is to expect what human nature cannot perform. The work becomes impossible.

Inadequate knowledge of technicalities in the juries.

67. Another defect in the system of juries, is the incompetency of the tribunal to deal satisfactorily with all the numerous technical subdivisions necessarily grouped under one heading. Not thirty juries, but at least a hundred are wanted. It must be admitted that the judgment should be based upon technical knowledge, or it is of little worth. It would be difficult to name many classes in which the variety of technical knowledge possessed by their juries was adequate to pass judgment on all the technical subdivisions of the class. Besides, the very national varieties—each one peculiar to its own country—which exist in every subdivision of every class, render it impossible to fix any standard of excellence.

68. In the Paris Exhibition five kinds of rewards of different grades were established, so that the difficulty of assigning the reward exactly suitable to every case was greater than in London, where there were only three.*

Impossible to avoid omissions.

69. Next is the impossibility of avoiding oversights in the enormous mass of objects which a Universal Exhibition brings together. The rules of the Imperial Commission were intended to provide against oversights. Special Commissioners were to have been appointed, to see that the goods of no exhibitor escaped examination, but no appointments were made (*see* page 44. Art. 74.) The responsibility of looking after everything devolved entirely upon the Jurors themselves; and perhaps it may be allowable to remark, that the local arrangements of the objects in the Paris Exhibition were not calculated to assist the Jurors in their examinations. Some difficulties, inherent in the case (*see* pars. 75, 76. pages 25 and 26), have been already noticed.

70. Attempts were made in the British section to secure for every object its proper examination, at least by the British Jurors, but they all failed. Repeated notices were given to

* In Paris, for the Industrial Division, there was,—1. A large Gold Grande Médaille d'Honneur. 2. A small Gold Médaille d'Honneur. 3. A Silver Medal. 4. A Bronze Medal. 5. An Honourable Mention; and perhaps the Legion of Honour, largely distributed by the Emperor, may be considered a sixth. In London, it was Sir Robert Peel who suggested that all the medals should be of bronze, and there were only two, a Council Medal and a Prize Medal, and an Honourable Mention. In Paris, considerable efforts were made to maintain a distinction between the value of the medals, whilst in London the tendency was the reverse, carried so far, that a bronze medal was presented to *every* exhibitor, as a recognition of the aid he gave.

agents and exhibitors of the visits of the Jurors, but still there were many things which passed unnoticed at all. I will only glance at four. Two, the like of which were not exhibited by any other countries, were eagerly sought for by several foreign Governments at the conclusion of the Exhibition; a third, a marked type of civilized progress in all its developments, the product of the most perfect commercial organization of its kind at the present time, demanding the most varied powers in its management, extending its influence over the whole globe, and the non-appearance of which for a single day would excite the inquiry of the world; whilst a fourth was a modern invention, produced within the last fifteen years, which every State in Europe has successfully adopted from England and made part of its financial system.

Instances of omissions.

71. Indeed, it must be confessed that the local arrangement of the articles in the building in Paris, placed considerable impediments in the way of any satisfactory comparison of the articles either by the public or by the juries.

72. The local arrangement of the articles is so important, and is so influential upon a proper examination of them, that I venture to digress somewhat from the subject of the juries, to say a few words on that of the arrangement.

The local arrangement of the objects exhibited, may be geographical or scientific.

73. In London, the geographical principle of arrangement was adopted, although a scientific one had been much desired by H.R.H. the President of the Commission in 1851; but the total want of knowledge of the details of the probable extent of the various groups of foreign goods, rendered it impossible to attempt a scientific arrangement within the limits of the time, and it became necessary to abandon it.

74. The experience obtained in London and Paris of the space occupied by the several kinds of goods would render the scientific arrangement of any future Universal Exhibition comparatively easy, provided the subdivision was not carried too far. Thirty classes, however, is not sufficiently numerous, but probably 100 would be. Such a number of scientific groups of goods, a portion of space for each group being offered to each exhibiting nation, might have been readily laid out in a series of buildings like those of the Paris Exhibition. But such an arrangement ought not, on any account to be attempted, without adhering to a well-matured plan, definitively settled before-hand, and which ought not to be altered.

Scientific arrangement now practicable.

75. In Paris, the principle of the arrangement was intended to be geographical, the goods of each country being

The geographical principle adopted in Paris.

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together. But from the very beginning there were two distinct buildings, the Palais and the Annexe, and subsequently the Panorama; and three other structures, for agriculture, carriages, and cheap articles were added. The principal building, the Palais, had its basement and a gallery above. The Annexe was divided into two parts, one having upper galleries on each side. Besides, there were large spaces on the staircases, at first intended for refreshments, and subsequently used to exhibit goods. There were also exhibiting spaces in the open ground. In fact, the goods of the larger exhibiting nations were placed in seven or eight distinct localities, whilst those of France were to be found in all parts of every building and open space.* (*See* map.)

Classification.

76. The theoretical classification of the articles on paper did not agree with the local arrangement of them, and afforded no assistance in the consultation. Indeed, it may be said that the first was not practical, and many instances might be cited where the same articles might be found placed under different heads of the classification. Stoves, for example, might be found as "objects for heating" in one class, as iron manufactures in another, as steel manufactures in a third, &c.

77. The several structures of the Paris Exhibition being so varied in character were particularly adapted to a scientific arrangement of the goods, whereby the labour of the juries would have been materially assisted. But the principle of the arrangement had been settled before the nature and extent of the buildings had been determined.†

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* Thus, British goods, as such arranged professedly on the geographical principle, were to be found in the following places :—

1. Remarkable objects, as trophies, in the nave of the Palais.
2. Manufactures in the basement of the Palais.
3. Manufactures in the gallery of the Palais.
4. Colonial productions, &c. on the staircase of the Palais.
5. Manufactures in the panorama.
6. Manufactures in the outbuilding appropriated to cheap articles.
7. A miscellaneous collection of heavy and other manufactures in the grounds outside the Palais.
8. Raw produce, chemical manufactures, agricultural machinery, and Canadian productions, in the basement of the east end of the Annexe.
9. Colonial productions and agriculture in the south gallery of the east end of the Annexe.
10. Colonial productions chiefly in the north gallery of the east end of the Annexe.
11. Machinery and carriages in the basement of the west end of the Annexe.

† The buildings expanded according to the demands made by French exhibitors for space, until the exhibiting area was nearly double its original extent; and the original proportions of the division of space between France and foreign countries became altogether changed. At the first the space was

To revert to the subject of juries, it may be said that juries are found to act well in agricultural and flower shows, but it has already been pointed out that the work is of small and manageable extent, occupying only a few days, whilst similar work in an universal exhibition occupies months, and practically gets beyond control.

The work of jurors is beyond control.

78. The most remarkable instance of this was furnished in the Paris Exhibition. The awards had been made by the several juries, confirmed by the groups of juries, and revised by the Council of Presidents of Juries, strictly according to decrees. The labours of five months seemed to have ended, and almost everyone had departed. Totals were made of the number of gold medals which had thus been awarded, when they were considered much too numerous to the Imperial Commission. This information was obtained only within a fortnight of the ceremony of distributing the prizes, and it was thought absolutely necessary to appoint a new committee of seven persons—four being French, and three foreigners,—to classify the *Médailles d'Honneur* into two grades, and to resolve who should receive the higher or the lower grade (*see* page 49).

Awards made and revised.

79. Thus the work of several hundred persons, possessing all kinds of knowledge, who had been brought together from all parts of Europe, was finally revised by a very small committee created at the last moment, and whose knowledge was necessarily limited.

80. The foregoing brief observations which I have ventured to submit to your Lordship on the proceedings of the juries, seem to me to justify the conclusion that it is impossible in an Universal Exhibition to render the working of them satisfactory, and that it would be best, and most in accordance with the spirit of the present times, to abandon them altogether. This, at least, appears to be certain, that the judgment of any so-called international jury practically becomes a *national* judgment of the country where the exhibition is held, and that it would be much sounder

equally divided, but before the end of the Exhibition France occupied nearly two-third parts of the whole. The preparations of the panorama, lying between the *Palais* and the *Annexe*, were not even commenced till within fifteen days of the opening as first announced. The postponement of the opening, and the incompleteness of the arrangements, must be attributed chiefly to the absence of any settled plan of the extent and size of the Exhibition at a sufficiently early period to insure completeness and punctuality. The Paris Exhibition could not be said to be complete till nearly the 1st August instead of the 1st May. Owing to this circumstance, great latitude was allowed in the admission of goods ; indeed, the admission lasted during the whole period of the Exhibition. But such licence is very much opposed to a proper performance of the duties of the juries, and was a source of disturbance to their judgments in London to very limited extent, but to a great one in Paris.

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Nomination of jurors should be left to the country holding the Exhibition.

in principle to recognize this fact, and to leave *the judgment* and the *appointment of Jurors entirely in the hands of the country which holds the Exhibition.* This, indeed, was very much the feeling of the Board of Trade even on the present occasion, when in consenting to appoint Jurors, the Imperial Commissioners were informed that the Board would have been quite content to leave the duty in their hands.

82. In conclusion, I proceed to lay before your Lordship a brief summary of the measures which I submit, might be taken in any future Universal Exhibition.

I. THOSE ON THE PART OF THE GOVERNMENT.

Measures to be taken by the Government in future Exhibitions.

a. Having received the invitation to co-operate from the foreign country, it would be for the Board of Trade to make known the terms of the proposed Exhibition to Chambers of Commerce, &c., to assist in forming committees, which should consist rather of exhibitors and those having a *status* in the Exhibition, than of persons or bodies not contributing to it.

b. When committees had been formed, to induce them to agree in constituting a central management for themselves.

c. To accredit such management to the authorities managing the proposed foreign Exhibition.

d. To assist in causing reports on the departments of the foreign Exhibition to be made, inducing the preparation of them rather by commercial and scientific authorities than direct nominees of the Government. First editions of such reports should be certainly published whilst the Exhibition was open, as their utility would be much increased. It was found that such reports were much wanted both in London and Paris.

e. Should the Government think fit itself to exhibit such objects as national surveys, models of ships, or other objects in which it acts as the producer, it would do so as a simple exhibitor conforming to the ordinary regulations.

f. With respect to the Colonies exhibiting, the Government would accredit the agents named by the Colonies, and in like manner induce the agents to elect a general manager among themselves.

g. It would prevent difficulty if the Board of Trade should undertake to divide the space between the United Kingdom and the Colonies, in case such space should be allotted in bulk by the foreign Government.

h. To obtain facilities from the Customs in returning goods at the close of the Exhibition.

i. To decline to appoint Jurors.

II.—On the Part of the Exhibitors.

a. To form themselves into trade committees.

Measures to be taken by exhibitors in future Exhibitions.

b. The committee to elect, in concert with the Colonial committees, a manager, with ample powers, to proceed to the foreign country. When there, he must he invested with full authority to deal with defaulters, and do whatever is necessary to complete the Exhibition and insure punctuality. In spite of all efforts, some few exhibitors will be unpunctual, and such parties always contend for the reservation of privileges, which if conceded would render the Exhibition imperfect.

c. To print a list of the proposed exhibitors and their addresses as soon as they are ascertained. This will be found of great convenience in shipping the goods, in receiving them abroad, and making the arrangements in the Exhibition, and in conducting correspondence. It was one of the most useful steps taken in the Paris Exhibition, and should be carried out at as early a stage of the proceedings as possible. It is very important to keep the exhibitors fully informed of the necessary regulations as they are made in the progress of the work. It saves much correspondence with individuals, secures uniformity of action, and creates in the minds of the parties interested an accurate sense of the necessities of the work. Moreover, short documents issued frequently attract more attention than lengthy ones issued at long intervals. These, collected together when the work is done, may appear numerous, and many of them superfluous; but their utility is to be judged by the general result. A list of those issued on the present occasion is appended (see page 64), and it may be safely asserted that the economy of twenty per cent. effected in the management would hardly have been obtained without a generous outlay in distributing information. It is hardly possible to err on the side of giving information too fully, where it is important to enlist voluntary assistance.

d. To organize for the shipping of the goods. The employment of a single agent at only one port of departure will be found both economical and convenient.

e. Before any goods are shipped it will save much cost and trouble to ascertain that the Exhibition buildings abroad are quite ready to receive them, and to send no goods until there is satisfactory assurance of this fact. At least two months' delay and vexation would have been spared in Paris if no goods had been sent until the floor, the shafting, and

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galleries of the Annexe had been completed; and it would be best for all parties to decline courteously to send goods until the building is quite fit to receive them.

f. It may be somewhat costly, but will prove cheapest in the end, to send abroad a sufficient staff of workmen and tools, especially carpenters and men accustomed to place machinery. The importation of one or more moveable cranes would have been most useful. Not a single one was employed in Paris to assist in unloading the goods. The safest course is to be self-reliant for executing all such details. This was followed especially in the exhibition of the Fine Arts where English workmen were employed. Had it been different, the arrangement and closing of the British part of the Fine Arts Exhibition would have been much delayed.

g. To engage a separate warehouse in the foreign country to store the empty packing-cases during the Exhibition. This will be found a convenience well worth paying for. The extent of accommodation should be regulated by the number of cases likely to be returned at the close of the Exhibition.

h. An effort should be made to obtain sufficient office accommodation in the Exhibition building itself, which supersede the necessity for separate offices out of it.

i. The preparation of cases, stands, &c., will be best left to each exhibitor or group of exhibitors who may please to act in concert. The fewer rules on this point, the better; glass cases, in fact, are undesirable. In the Exhibition of 1851, the fewest possible rules were prescribed to exhibitors in the preparation of their glass cases, the principle being to allow as much freedom and exercise of individual judgment as possible; on the contrary, in 1855, the Imperial Commission were very anxious that glass cases and frames for exhibiting should be adopted, of an uniform character, and in the nave of the Palais it was absolutely enforced upon British exhibitors to use cases of a particular height and size, and pattern, as the condition of occupying that position, however unsuitable they might be for displaying their goods. The exhibitors submitted, and incurred some thousands of pounds expense to prepare them, although quite against their own judgment These cases proved to be most unsuitable for their purpose, and were a serious defect in the general appearance of the nave This was apparent in those parts where French exhibitors having been less obedient to the rules of the Imperial Commission than British exhibitors, had declined to erect the prescribed form of case. In 1851, the rule was to prohibit glass cases in the nave In 1855, the

contrary rule prevailed, and, notwithstanding every effort was made to prevent the flat, dusty tops of the cases from being an eyesore from the galleries above, by erecting a kind of roofing to them, they were felt to be a great defect throughout the whole period of the Exhibition. The result proved the superiority of the plan in the London Exhibition, and has confirmed the wisdom of the rule that glass cases and high stands should be avoided as much as possible; indeed, except where absolutely necessary, it would be better to prohibit them. Another lesson taught by the arrangement of the Paris Exhibition was to keep high erections rather to the sides than place them in the centre of galleries.

83. Upon the basis of the expenditure incurred by the Government for the Paris Exhibition, namely, 40,000*l.* out of the vote of 50,000*l.*; it may be estimated that the cost of management of any future Exhibition, excluding the Fine Arts Division, ought not to be more. It would not be *less*, as expenses can be controlled all the more in proportion as the executive management is central, and the responsibility individual. Should the course of action now pointed out be adopted, an expense of 10,000*l.* might be defrayed by the Government for preliminary expenses, distributing information, and assistance in preparing reports on the Foreign Exhibition, on condition that the balance of 30,000*l.* should be undertaken by exhibitors, in order to pay the expenses of transit and general management. A guarantee fund exceeding this amount should be obtained from intending exhibitors, and a deposit paid, each committee or exhibitor contributing in proportion to the amount of space allotted to them.

I have the honour to be, &c.

Henry Cole.

APPENDICES TO MR. COLE'S REPORT.

APPENDIX (A.)

(I.)

DECREES, REGULATIONS, AND INSTRUCTIONS OF THE IMPERIAL COMMISSION.

DECREES.

Decree ordering the Exhibition.

NAPOLEON, by the grace of God, and the national will, EMPEROR OF THE FRENCH, to all whom it may concern, greeting:

On the report of our Minister, Secretary of State for the department of the Interior,

WE HAVE DECREED and DO HEREBY DECREE, as follows:

ART. 1.—An Universal Exhibition of agricultural and manufacturing products will be opened at Paris, in the Palace of Industry, on the Carré de Marigny, on the 1st May 1855, and will close on the 30th of September following.*

The products of all nations will be admitted to this Exhibition.

ART. 2.—The quinquennial Exhibition, which, by the terms of Art. 5 of the Decree of the 4th of October 1853, was to open on the 1st May 1854, will be united to the Universal Exhibition.

ART. 3.—A future decree will fix the conditions under which the Universal Exhibition will take place, the regulations under which the goods exhibited will be placed, and the various kinds of objects capable of being admitted.

ART. 4.—Our Minister, Secretary of State for the department of the Interior, is charged with the execution of the present Decree.

Given at the Palace of the Tuileries, this 8th of March 1853.

(Signed) NAPOLEON.

(Countersigned) F. DE PERSIGNY,
Minister, Secretary of State for the Interior.

Decree ordering the Exhibition of Fine Arts.

NAPOLEON, by the grace of God, and the national will, EMPEROR OF THE FRENCH, to all whom it may concern, greeting:

Considering that one of the most efficient means of contributing to the progress of the arts is an Universal Exhibition, which, by throwing open a field for competition to all the artists of the world, and by placing so many various works in face of each other, ought to be a powerful motive to emulation, and present an occasion for fruitful comparisons;

Considering that the improvement of manufactures is closely connected with that of the Fine Arts;

That, however, all the Exhibitions of industrial products which have been hitherto held, have admitted the works of artists in only a very insufficient proportion;

That it belongs especially to France, whose manufactures owe so much to the Fine Arts, to assign to them in the coming Universal Exhibition, the place which they merit;

* The date fixed for the closing of the Exhibition has been extended to October 31. (*Vide* Art. 1. of the General Regulations.)

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Appendix A.

We have decreed and do hereby decree, as follows:

Art. 1.—An Universal Exhibition of the Fine Arts will be held at Paris at the same time as the Universal Exhibition of Industry.

The place in which this Exhibition will be held will be designated hereafter.

Art. 2.—The annual Exhibition of the Fine Arts of 1854 is postponed to 1855, and united with the Universal Exhibition.

Art. 3.—Our Minister of State is charged with the execution of the present Decree.

Given at the Palace of Saint Cloud, this 22nd of June 1853.

(Signed) Napoleon.

(Countersigned) Achille Fould, Minister of State.

Decree appointing the Imperial Commission.

Napoleon, by the grace of God, and the national will, Emperor of the French, to all whom it may concern, greeting:

On the report of our Minister, Secretary of State for the department of Agriculture, Commerce, and Public Works;

Taking into consideration our Decrees of the 8th of March and 22nd of June last, declaring that there will be opened at Paris, on the 1st of May 1855, an Universal Exhibition of the products of Agriculture, Manufactures, and the Fine Arts;

We have decreed and do hereby decree, as follows:

Art. 1.—The Universal Exhibition of the products of Agriculture, Manufactures, and the Fine Arts is placed under the direction and superintendence of a Commission, of which our well-beloved cousin, Prince Napoleon, will be the President.

Art. 2.—That Commission is composed of the following members:

MM. Baroche, president of the Council of State;
Elie de Beaumont, senator, member of the Institute;
Billault, president of the Legislative Body;
Blanqui, member of the Institute, director of the Upper School of Commerce;
Eugène Delacroix, painter, member of the Municipal and Departmental Commission of the Seine;
Jean Dollfus, manufacturer;
Arlès Dufour, member of the Chamber of Commerce of Lyons;
Dumas, senator, member of the Institute;
Baron Charles Dupin, senator, member of the Institute;
Henriquel-Dupont, member of the Institute;
Count de Gasparin, member of the Institute;
Gréterin, councillor of State, director-general of Customs and Indirect Taxes;
Heurtier, councillor of State, director-general of Agriculture and Commerce;
Ingres, member of the Institute;
Legentil, president of the Chamber of Commerce of Paris;
Leplay, engineer-in-chief of mines;
Count de Lesseps, director of consulates and of commercial affairs at the Ministry of Foreign Affairs;
Mérimeé, senator, member of the Institute;
Michel Chevalier, councillor of State, member of the Institute;
Mimerel, senator;
General Morin, director of the Conservatoire Impérial des Arts et Métiers;
Count de Morny, deputy to the Legislative Body, member of the Superior Council of Commerce, Agriculture, and Manufactures;
Prince de la Moskowa, senator;
Duke de Mouchy, senator, member of the Superior Council of Commerce, Agriculture, and Manufactures;
Marquis de Pastoret, senator, member of the Institute;

Emile Péreire, president of the board of directors of the Southern Railway;
General Poncelet, member of the Institute;
Regnault, member of the Institute, administrator of the Imperial Manufactory of Sèvres;
Sallandrouze, manufacturer, deputy to the Legislative Body;
De Saulcy, member of the Institute, curator of the Museum of Artillery;
Schneider, vice-president of the Legislative Body, member of the Superior Council of Commerce, Agriculture, and Manufactures;
Baron Seillière (Achille);
Seydoux, deputy to the Legislative Body;
Simart, member of the Institute;
Troplong, president of the Senate, first president of the Court of Cassation, member of the Institute;
Marshal Count Vaillant, grand marshal of the Palace, senator, member of the Institute;
Visconti, member of the Institute, architect to the Emperor.

ART. 3.—The Commission is divided into two sections:
That of the Fine Arts, and that of Agriculture and Manufactures.

The following are the members of the section of the Fine Arts:

MM. Baroche,	MM. Prince de la Moscowa,
Eugène Delacroix,	Duke de Mouchy,
Henriquel-Dupont,	Marquis de Pastoret,
Ingres,	De Saulcy,
Mérimée,	Simart,
Count de Morny,	Visconti

The following are the members of the section of Agriculture and Manufactures:

MM. Elie de Beaumont,	MM. Count de Lesseps,
Billault,	Mimerel,
Blanqui,	General Morin,
Michel Chevalier,	Emile Péreire,
Dollfus (Jean),	General Poncelet,
Arlès-Dufour,	Regnault,
Dumas,	Sallandrouze,
Baron Charles Dupin,	Schneider,
Count de Gasparin,	Seillière,
Gréterin,	Seydoux,
Heurtier,	Troplong,
Legentil,	Marshal Count Vaillant.
Leplay,	

ART. 4.—In the absence of Prince Napoleon, the Commission, when assembled at a general meeting, will be presided over by the Minister of State, or by the Minister of Agriculture, Commerce, and Public Works; and in default of these gentlemen, by a vice-president, ballotted for at the first sitting.

The section of the Fine Arts will be presided over by the Minister of State; and the section of Agriculture and Manufactures, by the Minister of Agriculture, Commerce, and Public Works.

Each section will elect a vice-president.

ART. 5.—M. Arlès-Dufour is appointed Secretary of the Commission, and M. Adolphe Thibaudeau, Assistant-Secretary.

M. de Mercy, chief of the section of the Fine Arts at the Ministry of State, is named Secretary of the section of the Fine Arts.

M. Audiganne and M. Chemin-Dupontes, respectively heads of the departments of Manufactures and of Commerce and Navigation at the Ministry of Agriculture, Commerce, and Public Works, are nominated Secretaries of the section of Agriculture and Manufactures.

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Art. 6.—Our Minister of State, and our Minister, Secretary of State for the department of Agriculture, Commerce, and Public Works, are charged with the execution of the present decree.

Given at the Palace of the Tuileries, this 24th of December 1853.

Appendix A.

(Signed) Napoleon.

(Countersigned) Achille Fould, Minister of State.
P. Magne, Minister, Secretary of State for Agriculture, Commerce, and Public Works.

The Imperial Commission assembled for the first time on the 29th of December 1853, at the Palais-Royal, Prince Napoleon presiding. His Imperial Highness, after reading the Decrees appointing the Commission, delivered the following address:

Address of Prince Napoleon.

Gentlemen,

The Emperor confides to us a noble and honourable mission, when he charges us to organize this grand competition, in which France will show herself worthy of her name, by the eagerness with which her artists and her manufacturers will respond to the appeal which is made to them.

Our duty towards foreigners is to receive them with a liberal and kind-hearted hospitality.

All opinions in matters of political economy are represented in our body, not for the purpose of entering into fruitless discussions, foreign to our mission, but of co-operating with equal ardour, whatever may be their point of view, in the success of this work, which is calculated to throw so great a lustre on the France and Europe of the nineteenth century.

On that point, Gentlemen, there cannot be any difference of opinion amongst us.

The Emperor has testified his high impartiality in assembling in the same body the leading men in politics, science, arts, manufactures, and commerce.

For the first time, an Universal Exhibition of the Fine Arts will be joined to an Universal Exhibition of Industry.

It belongs to our country to set the example of this alliance, which is so well suited to our initiatory genius.

I hope, Gentlemen, that the most entire confidence will reign in our relations, and I ask you to grant me, as your President, that indulgence of which I stand in need.

Feeling my insufficiency for the great mission which the confidence of the Emperor has been pleased to confer on me, I shall at least devote to it my most ardent zeal, and the firm determination to act for the best, which is the first condition of success.

The questions which we shall have to solve are numerous and complicated, and are connected with a multitude of diversified interests: I propose to submit them to your decision successively, as they present themselves, in order not to overburden ourselves uselessly at the commencement of our labours.

They naturally divide themselves into two great parts:—the questions which may call for decrees on the part of His Majesty, and those which we can solve on our own authority.

In execution of the Decree which has been published, our first operation is the nomination of the vice-president of the General Commission, and of the two vice-presidents of the sections of Manufactures and of the Fine Arts.

I shall afterwards request you to appoint a sub-commission to assist me in the execution of the measures which you shall have decided on. Business can only be got through in a practical manner by a small number of persons devoting to it their special aptitude and their time.

The first question to occupy the attention of that sub-commission will be to draw up a series of regulations for the prompt despatch of the numerous affairs which we shall have to settle.

The general regulations, framed by the Imperial Commission for the management of the Universal Exhibition, were approved of by the following Decree:

Napoleon, by the grace of God, and the national will, Emperor of the French, to all whom it may concern, greeting:

Considering the draft of the general regulations proposed by the Imperial Commission for the Universal Exhibition of the products of Agriculture, Industry, and the Fine Arts,

Decree approving the Regulations.

We have decreed and do hereby decree, as follows:

The general regulations for the Universal Exhibition, annexed to the present Decree, are hereby approved of.

Given at the Palace of the Tuileries, this 6th of April 1854.

(Signed) Napoleon.

(Countersigned) Achille Fould, Minister of State.
P. Magne, Minister, Secretary of State for Agriculture, Commerce, and Public Works.

GENERAL REGULATIONS.

General Arrangements.

General Regulations.

Art. 1.—The Universal Exhibition, appointed to be held at Paris in the year 1855, will receive the agricultural and manufacturing products, as well as the works of Art, of all nations.

It will open on the 1st of May, and will close on the 31st of October of the same year.

Art. 2.—The Universal Exhibition of 1855 is placed under the direction of the Imperial Commission, nominated by the Decree of the 24th of December 1853.

Art. 3.—In every department, a committee, nominated by the Prefect, in accordance with the instructions of the Imperial Commission, will be charged with the necessary measures for the success of the Exhibition, and with the admission and rejection, at the proper time, of the articles presented.

There shall also be appointed, should the Imperial Commission deem it necessary, local sub-committees or special agents, in every town and centre of industry, where the necessity of them may be felt.

Art. 4.—Special instructions will be addressed, in the name of the Imperial Commission, to the Ministers of War and Marine, with regard to the exhibition of the products of Algeria and of the French colonies.

Art. 5.—Foreign Governments will be invited to appoint, for the examination, selection, and transmission of their national products, committees, the formation and composition of which should be notified as soon as possible to the Imperial Commission, in order that it may immediately place itself in communication with such committees.

Art. 6.—The departmental committees, as well as the foreign committees authorized by their respective Governments, will correspond directly with the Imperial Commission, which will not hold any correspondence whatever with the exhibitors themselves, or with other private persons, either French or foreigners.

Art. 7—Such French subjects or foreigners, as intend exhibiting, should apply to the committee of the department, colony, or country which they inhabit.

Foreigners, residing in France, may apply to the official committees of their respective countries.

Art. 8.—No article will be admitted to the Exhibition, if not sent with the authorization and under the seal of the departmental or foreign committees.

Art. 9.—The foreign and departmental committees should make known, as soon as possible, the presumed number of exhibitors in their division, and the space which it is supposed they will require.

Art. 10.—On receipt of that intimation, the Imperial Commission will, without delay, proceed to the division of the general space amongst France and the other countries, in proportion to the demands sent in.

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Appendix A.

Art. 11.—When that division has been effected, notice of the same will be immediately sent to the French and Foreign committees, who will have to subdivide the space thus allotted to them amongst the exhibitors of their divisions.

Art. 12.—The lists of the exhibitors who are admitted must be sent to the Imperial Commission, by the 30th of November 1854, at the latest.

These lists ought to mention:

1st. The names, Christian names (or name of firm), profession, and address of the parties applying;

2nd. The nature and number or quantity of the articles which they desire to exhibit;

3rd. The space which they require in height, width, and depth.

These lists, as well as all other documents coming from foreign countries, ought, as much as possible, to be accompanied by a French translation.

Admission and Classification of Products.

Admission of Products.

Art 13.—All the products of Agriculture, Manufactures, and Art are admissible to the Universal Exhibition, with the exception of those included in the following categories:

1st. Living animals and plants;

2nd. Fresh vegetables and animal substances of a nature liable to be spoiled from keeping;

3rd. Detonating substances, and, in general, all such as may be considered dangerous;

4th. And, finally, products in such quantities as would exceed the objects of the Exhibition.

Art. 14.—Spirits or alcohols, oils and essences, acids and corrosive salts, and generally substances easy inflammable, or of a nature to produce combustion, will only be admitted to the Exhibition when contained in solid and perfectly closed vessels; the owners of such articles will, besides, be bound to conform to such measures of safety as may be prescribed to them.

Art. 15.—The Imperial Commission will have the right of excluding, on the proposition of the competent agents, such French objects as may appear to it injurious or incompatible with the objects of the Exhibition, and those which have been sent in excess of what is required or are unfit for exhibition.

Classification of Products.

Art. 16.* —The objects sent for exhibition will form two distinct divisions: *Products of Industry* and *Works of Art.* They will be distributed, for each country, into eight groups, comprising thirty sections, viz.:

1st Division.—Products of Industry.

1st Group.—*Industrial pursuits having for principal object the extraction of production of raw materials.*

1st Class. Mining and metallurgical products.
2nd — Everything relating to the management of trees, or to hunting, shooting, and fishing, and products obtained without cultivation.
3rd — Agriculture.

2nd Group.—*Industrial pursuits having specially for object the employment of mechanical power.*

4th Class. Machinery in general, as applied to industry.
5th — Special machinery and apparatus for railways, and other modes of transport.
6th — Special machinery and apparatus for workshops.
7th — Special machinery and apparatus for the manufacture of woven fabrics.

* A document entitled "System of Classification," and specifying the division of all branches of manufactures and of all the arts, of their raw materials, their means of action and their products, amongst the thirty sections established in this article, was published.

3rd Group.—*Manufactures specially based on the employment of physical and chemical agents, or connected with the sciences and instruction.*

8th Class. Arts relating to the exact sciences and to instruction.
9th — Manufactures relating to the economical production and employment of heat, light, and electricity.
10th — Chemical manufactures, dyeing and printing, paper, leather, skins, India-rubber, &c.
11th — Preparation and preservation of alimentary substances.

4th Group.—*Industrial pursuits specially connected with the learned professions.*

12th Class. Hygiène, pharmacy, surgery, and medicine.
13th — Naval and military arts.
14th — Civil engineering and building.

5th Group.—*Manufactures of mineral products.*

15th Class. Steel and its products
16th — General metal work.
17th — Goldsmith's work, jewellery, and bronzes.
18th — Glass and pottery.

6th Group.—*Woven fabrics.*

19th Class. Cotton manufactures.
20th — Woollen and worsted manufactures.
21st — Silk manufactures.
22nd — Flax and hemp manufactures.
23rd — Hosiery, carpets, embroidery, lace of every kind, gold and silver fringes, &c.

7th Group.—*Decorative furniture and upholstery, millinery, industrial design, printing, and music.*

24th Class. Furniture and decoration.
25th — Articles of clothing, objects of fashion and fancy.
26th — Drawing and modelling applied to industry, letter-press and copper-plate printing, photography.
27th — Manufacture of musical instruments.

2nd Division.—Works of Art.

8th Group.—*Fine Arts.*

28th Class. Painting, engraving, and lithography.
29th — Sculpture and die-sinking.
30th — Architecture.

Reception and Placing of Goods.

Art. 17.—The various objects, both French and foreign, will be received at the Exhibition Palace, from the 15th of January to the 15th of March 1855, inclusive. Reception of goods.

Nevertheless, an extension of time will be granted for such manufactured articles as are likely to suffer from being too long packed up, on condition that the arrangements necessary for their exhibition shall have been made beforehand. This delay cannot in any case extend beyond the 15th of April.

Heavy and cumbersome articles, or any others the placing of which would require considerable labour, must be sent before the end of February.

Art. 18.—The committees of each country and of each French department, are requested to send, as much as possible, in one consignment, the products of their divisions.

Art. 19. The consignment of each exhibitor, whether sent with those of other exhibitors or separately, must be accompanied by the bulletin of admission delivered by the competent authority. This bulletin drawn up in triplicate and in the form prescribed by Art. 12, must likewise contain the number and weight of the packages, as well as the particulars and price of every article composing the consignment.

Forms of these bulletins will be sent to all the committees, French and foreign.

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Art. 20.—The French objects intended for the Universal Exhibition will be forwarded from the places appointed for the purpose by the departmental and colonial committees, and taken back from Paris to the same places, at the expense of the State.

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Foreign articles, having the same destination, will likewise be conveyed to Paris at the cost of the State, but only from the French frontier, and will be sent back under the same conditions.

Form of address.

Art. 21.—They must be addressed to the Commissioner of Arrangement at the Exhibition Palace.

Art. 22.—The address of each package, destined for the Exhibition, ought to indicate, in clear and legible characters—

i. The place from which it comes,

ii. The name of the exhibitor,

iii. The nature of the contents.

FORM OF ADDRESS.

A Monsieur le Commissaire du Classement de l'Exposition Universelle.

Au Palais de l'Exposition—PARIS.

Envoi de (here come the name and Christian names of the person sending, or the name of the firm,) *demeurant à* (residence or address), *exposant de* (nature of the produce).

Art. 23.—Packages containing articles sent by several exhibitors must have the names of all those exhibitors on the address, and be accompanied by a separate bulletin of admission for each of them.

Art. 24.—Exhibitors are requested not to send separately packages of less dimensions than half a cubic metre, but to place in the same packing-case with other packages of the same class, such as come within these dimensions.

Art. 25.—The admission of articles to the Exhibition will be gratuitous.

Art. 26.—Exhibitors will not be subjected to payments of any kind, either for entrance or space, or on any other pretext whatever, during the whole time of the Exhibition.

Moving and placing of goods.

Art. 27.—The Imperial Commission will provide for the moving, placing, and arranging of articles in the interior of the Exhibition Palace : as well as for the works necessary to set the machinery in motion.

Art. 28.—Tables or counters, flooring, enclosures, barriers, and partitions between the various classes of products, will be furnished gratuitously.

Art. 29.—All special arrangements and requirements, such as steps, shelves, supports, suspenders, glass-cases, hangings, draperies, paintings, and ornaments will be at the charge of the exhibitors.

Art. 30.—These dispositions, arrangements, and ornamentations can only be executed in conformity with the general plan, and under the superintendence of the inspectors, who will determine the height and form of the frontage of the stalls, and likewise the colour of the paint, hangings, and draperies.

Art. 31.—Contractors, designated or approved of by the Imperial Commission, will hold themselves at the disposal of the exhibitors, and their bills will be examined by agents specially appointed for the purpose, should the exhibitors desire it.

Nevertheless, exhibitors will be at liberty to employ such workmen as they may think fit, having previously obtained the authorization of the Commission.

Art. 32.—Manufacturers wishing to exhibit machinery or other objects of very great weight or size, and which will require foundations or special constructions, must make a declaration to that effect, on their demand for space.

Art. 33.—Likewise, persons intending to exhibit machinery which is to be set in motion by steam, or fountains throwing up water, or hydraulic engines,

ought to make a declaration of their intention at an early period, and state the quantity and degree of pressure of steam or water which they will require.*

Art. 34.—The various products will be arranged together by nations, in the order of the classification indicated in Art. 16. Nevertheless, the different products exhibited by an individual corporate body, city, department, or colony, may, with the authorization of the Executive Committee, be exhibited in separate groups when that disposition does not materially interfere with the regular arrangements. Arrangement.

Art. 35.—The Imperial Commission will take every measure to preserve from damage the articles exhibited. Nevertheless, if notwithstanding these precautions, some disaster should chance to happen, the Commission will not hold itself responsible for the damage which might occur. These risks exhibitors must take on themselves, as likewise the expense of insurance, should they consider that precaution necessary. Care of the goods.

Art. 36.—The Imperial Commission will likewise take care that the goods shall be watched over by an active and numerous staff; the Commission will not, however, be responsible for any thefts or frauds which may take place.

Art. 37.—Each exhibitor will have the privilege of having his goods at the Exhibition taken care of by an agent chosen by himself. Notice must be given, from the outset, of the name and position of this agent. A personal card of admission will be given him, which, as long as the Exhibition remains open, he is neither to transfer nor lend, under pain of forfeiture. Agents may be appointed.

Art. 38.—The agents of exhibitors must confine themselves to answering such questions as may be addressed to them, and to delivering cards of address, prospectuses, or lists of prices, when asked for them.

They will be interdicted, under pain of expulsion, from soliciting the attention of visitors, or trying to induce them to purchase the articles exhibited.

Art 39.—The wholesale current trade price of any article, at the period of the Exhibition, may be prominently affixed to it.† Prices may be affixed to the articles.

Any exhibitor who may wish to avail himself of this permission must announce his intention beforehand to the local committee of his division, who will sanction the prices, after having ascertained their correctness.

The price thus affixed must, in case of a sale taking place, be strictly adhered to by the exhibitor, as regards the buyer.

In case the declaration should be found to be false, the Imperial Commission may order the goods to be removed, and the exhibitor precluded from exhibiting any longer.

Art. 40.—Articles sold cannot be removed until after the close of the Exhibition.

Foreign Goods.—Customs.

Art. 41.—With respect to foreign goods admitted to the Exhibition, the Exhibition Palace will be constituted a bonded warehouse. Customs arrangements for Foreign goods.

Art. 42.—These goods accompanied by the bulletins mentioned in Art. 19, will enter France by the ports and frontier towns here mentioned, viz :—

Lisle, Valenciennes, Forbach, Wissemburg, Strasburg, Saint-Louis, Les-Verrieres-de-Joux, Pont-de-Beauvoisin, Chaparellan, Saint-Laurent-du-Var, Marseilles, Cette, Port Vendres, Perpignan, Bayonne, Bordeaux, Nantes, Havre, Boulogne, Calais, and Dunkirk.

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* The following additional information relating to machinery in motion has been supplied by the Imperial Commission :—

1. The steam pressure will be 75 lbs. on the square inch (5 atmospheres), or less if required.

2. The available *pressure* of water will be equal to a head of 32 to 48 feet (10 to 15 metres); but it is desirable that all the water-wheels, and other hydraulic machines should be adapted to a *fall* of not more than 10 feet (3 metres.)

3. Neither gas, nor any other combustible, can be permitted to be burned in the building.

4. The shafting provided for driving machinery will be generally above the floor, though it may be placed below to suit particular cases, and the main horizontal shafts will be driven at a speed of from 60 to 80 revolutions in a minute.

5. Neither the produce of machines in motion, nor any other merchandise can be sold in the building, during the Exhibition.

† The Imperial Commission understands these words to apply to the *selling price of articles on leaving the factory where they were produced.*

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Art. 43.—Packages may be directed to agents designated by the Imperial Commission in each of these ports or towns. These agents, for a certain amount of remuneration fixed beforehand, will undertake the requisite custom-house formalities, and forward the goods to the Exhibition Palace.

Art. 44.—Foreign goods admitted into the Exhibition Palace will be taken charge of by the custom-house officers.

Art. 45.—The removal of the lead-stamps and the opening of the packages can only take place in the interior of the Palace, in the presence of the exhibitors or of their agents, and by the custom-house officers.

Art. 46.—One copy of the bulletin sent with each package to be considered as a certificate of origin, will be retained by the customs-department ; another copy will be left with the commissioner of arrangement at the Exhibition ; and the third will be deposited at the office of the Secretary of the Imperial Commission.

Art. 47.—Foreign exhibitors or their agents will have to declare, after the close of the Exhibition, whether their goods are intended for re-exportation or for interior consumption.

In the latter case, they will be at liberty to dispose of them immediately, after paying the duty, in the fixing of which the customs authorities will take into account the depreciation the goods may have undergone during their stay in the Exhibition.

Special duty fixed.

Art. 48.—Goods, at all other times prohibited, will, by special exception, be admitted to interior consumption, on paying a duty of 20 per cent. on their actual value. This amount of duty will be the maximum levied on any article exhibited.

Interior Organization and Police Arrangements.

Interior organization.

Art. 49.—The interior organization and police arrangements of the Exhibition are placed under the direction of an Executive Committee, composed of the different heads of departments, who will decide on all questions coming under their jurisdiction.

Art. 50.—A set of regulations, published before the time fixed for the reception of goods, and posted up at the Exhibition building, will decide all points relative to the order of the interior service, and will designate the persons whose duty it will be to assist the exhibitors, and to watch over the order and security of the Exhibition.

Art. 51.—The agents and officers, attached to the foreign divisions, must speak one or more of the languages of those nations, with which they are to be in communication.

Interpreters, designated by the Imperial Commission, will besides be placed in various parts of the foreign division.

Art. 52.—Foreign Governments will be requested to accredit to the Imperial Commission, special commissioners, whose duty it will be to represent their countrymen at the Exhibition, during the reception, classification, and placing of the goods, and in all circumstances where their interests are concerned.

Protection of Industrial Designs and Inventions.

Protection to inventors, &c.

Art. 53.—Every exhibitor who is the inventor or legal proprietor of any process, machine, or design admitted to the Exhibition, and not yet registered or patented, may obtain from the Imperial Commission a certificate descriptive of the article exhibited, provided he make an application to that effect before the opening, or during the first month after the opening of the Exhibition.

Art. 54.—This certificate will secure to the holder of it the property of the article therein described, and the exclusive privilege of employing it to the best advantage, for the period of one year from the 1st of May 1855, without prejudice to any patent which the exhibitor may take out, in the usual manner, before the expiration of that period.

Art. 55.—Every application for an inventor's certificate must be accompanied by an accurate description of the object or objects for which protection is sought, and, should it be necessary, by a plan or drawing of the said objects.

Art. 56.—These applications, as well as the decisions arrived at with regard to them, will be entered in a register kept for the purpose, which will be afterwards deposited at the office of the Minister of Agriculture, Commerce, and Public Works (department of industry), to be referred to as a proof during the period fixed for the validity of the certificates.

Art. 57.—These certificates will be delivered without any charge.

Juries and Rewards.

Juries.

Art. 58.—The examination of the articles exhibited, and the decisions with respect to their merit, will be confided to a great international mixed jury. This jury will be composed of members and deputies, who will be divided into thirty special juries, corresponding to the thirty classes mentioned in Art. 16.

Art. 59.—In the division of the products of Industry, the number of members for each special jury is fixed as follows :

For each of the classes :	Jurors.	Deputies.
3, 10, 20, and 23	14	4
2, 6, 16, 18, and 24	12	3
7, 8, 12, 13, 14, 17, 19, 21, 25, and 26	10	2
1, 4, 5, 9, 11, 15, 22, and 27	8	2
In the division of the Fine Arts,		
Class 28 will have	20	
29 —	11	
30 —	8	

Art. 60.—The number of Jurors to be appointed, will be for France, as well as for foreign nations, in proportion to the number of exhibitors furnished by each country.

Art. 61.—The official committee of each country will designate persons to form the number of jurors which that country is entitled to nominate.

The French jurors for the first 27 classes will be nominated by the section of Agriculture and Industry of the Imperial Commission, and for the last 3 classes, by the section of the Fine Arts.

Art. 62.—In case the committee of any country exhibiting should not appoint jurors to represent it, the duty will be undertaken at a general meeting of the jurors present.

Art. 63.—The Imperial Commission will make the division of the members of the international jury amongst the various classes. It will also fix the general rules which will serve as a basis for the operations of the special juries.

Art. 64.—Each special jury will have a president named by the Imperial Commission ; also a vice-president and a reporter, both of whom will be nominated by an absolute majority of the votes of the jury.

Art. 65.—In case none of the members should obtain the absolute majority the two candidates who have received the greatest number of votes will decide the point by lot.

Art. 66.—The president of each jury, and in his absence the vice-president, will, in case of an equal division, have the casting-vote.

Art. 67.—The special juries will besides be distributed into groups, representing the branches of industry, connected together by certain points of analogy or similitude.

These groups are eight in number, in conformity with the statement made in Art. 16.

The members of each group will elect their own president and vice-president.

Art. 68.—No decision of any special jury will be definitive unless sanctioned by the group to which it belongs.

Rewards.

Art. 69.—Rewards of the highest degree will not be granted until after they have been reconsidered by a council, composed of the presidents and vice-presidents of the special juries.

The jury for the Fine Arts is excepted from this regulation.

Art. 70.—Each special jury will be at liberty to call to its assistance, as associates or experts, one or more persons, technically acquainted with some of the articles submitted to it for examination. These persons may be selected from the members and deputies of the other classes, and from amongst persons who do not belong to the jury, but possess the required information. The members thus called in will only take part in the labours of the jury as regards the particular object for which their services were required ; they will only be entitled to take part in the discussion, and not to vote.

Art. 71.—Such exhibitors as may accept the functions of jurors or deputies, will be, by that fact only, rendered ineligible to receive any reward.

The jury for Fine Arts is excepted from this regulation.

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Art. 72.—Such exhibitors also as have been called in as associates or experts will be held ineligible to receive a reward, but only in the particular class in which they have acted.

Art. 73.—Each jury may, according to circumstances, subdivide itself into committees; but it cannot come to any decision without the sanction of the majority of the entire jury.

Art. 74.—Special commissioners, assisted by the inspectors of the Exhibition, will be charged to prepare the work for each jury; to see that the goods of no exhibitor escape examination; to receive the observations and complaints of the exhibitors; to have all omissions, errors, or confusions repaired; to take care that the established rules are observed; and to explain these rules to the juries, whenever any part of them may require interpretation.

Art. 75.—These commissioners will not interfere with the deliberations of the jury, further than to bring before them facts, remind them of rules, and present the complaints of exhibitors.

Art. 76.—The nature of the rewards to be distributed, and the general principles to be adopted as the basis of such rewards, will be at a later period determined by a decree framed on the recommendations of the Imperial Commission.

Art. 77.—Independently of the honorary distinctions which may be awarded, the Council of Presidents and Vice-presidents will have the power of recommending to the Emperor such exhibitors as it may think deserving of special marks of public gratitude, on account of extraordinary services rendered to civilization, humanity, science, and art; or of encouragements of a different kind on account of considerable sacrifices incurred with a view to general utility, due attention being paid to the position of the inventors or producers.

Special Arrangements for the Fine Arts.

Special arrangements for the Fine Arts.

Art. 78.—A French Jury, instituted at Paris, will decide on the admission of the works of French artists.

Art. 79.—The members of the French Jury of Admission will be nominated by the section of the Fine Arts of the Imperial Commission.

Art. 80.—The Jury of Admission for the Fine Arts will be divided into three sections:

The first will comprise painting, engraving and lithography;

The second, sculpture and dye-sinking;

The third, architecture.

Each of these sections will decide with respect to works belonging to its special department.

Art. 81.—The Exhibition is open to the works of all French and Foreign artists alive on the 22nd of June 1853, the date of the Decree constituting the Exhibition of Fine Arts.

Art. 82.—Artists can present to the Universal Exhibition works which have been previously exhibited; but there cannot be admitted—

1st. Copies (excepting such as may reproduce a work in a different style, on enamel, by drawing, &c.);

2nd. Pictures and other objects without frames;

3rd. Sculptures in unbaked clay.

Art. 83.—The following articles of the present regulations are applicable to the division of the Fine Arts:

Arts. 1 to 13; 15 to 30; 35, 36, 40, 41 to 47; 49 to 52; and 58 to 77.

(II.)

DECREE.

Decree determining the nature of the rewards.

Napoleon, by the grace of God, and the national will, Emperor of the French, to all whom it may concern, greeting:

After due consideration of Article 76 of the General Regulations with respect to the Universal Exhibition, approved of by our Decree, of the 6th of April 1854, on the proposition of the Imperial Commission for the Exhibition;—

We have decreed and do hereby decree, as follows:

Art. 1.—The rewards to be granted by the first 27 classes of the International Jury are to be;—1, the gold medal; 2, the silver medal; 3, the bronze medal; 4, the honourable mention.

Art. 2.—The gold medal can only be given to the first twenty-seven classes by the Council of Presidents and Vice-Presidents, on the proposition of the class juries, approved by the group to which each class belongs.

The gold medal can only be proposed and given, in the first twenty-seven classes for very complete collections contributed by Foreign States, or by Towns, or great centres of production, being of high utility in an instructive point of view; or for products exhibited by manufacturers, which are remarkable for extraordinary perfection due to art, to taste, to science, or to workmanship; or for very important discoveries or inventions usefully employed in industry; or for a very considerable increase in the utility of a product already known, and rendered, by the reduction of its cost, fit for more general consumption.

Art. 3.—The silver medal may be awarded by each of the juries for the first seven groups, on the proposition of the class juries of which they are formed, for superiority of taste, design, or workmanship; or for collections being of interest in an instructive point of view; or for real and important improvements introduced into a manufacture, either by invention or otherwise, thereby rendering articles of which there is a great consumption either better, more agreeable, more useful, or more durable, or reducing their cost.

Art. 4.—The bronze medal may be awarded by each of the juries for the first seven groups, on the proposition of the class juries of which they are formed, for good workmanship, design, or taste, or for real improvements effected either in the means of production, or in the utility of the products, or in the lessening of their cost.

Art. 5.—Honourable mention may be awarded by each of the juries for the first seven groups, on the proposition of the class juries of which they are formed, to the exhibitors of those products which are distinguished by any of the above merits, when the novelty of the invention or the small importance of the production does not call for a vote of the bronze medal.

Art. 6.—The groups may not give a reward unless it has been proposed by the jury of the class to which the exhibitor belongs.

Art. 7.—The jury should take into consideration, with regard to the prizes to be distributed, the reduction of the price of the exhibited articles, whenever this reduction is *bonâ fide*, and appears likely to be permanent.

Art. 8.—Foremen and workmen who have been pointed out for services rendered to the industry to which they belong, or for the part they have taken in the production of the articles exhibited and judged to be worthy of reward, may receive from the juries of the first seven groups, on the proposition of the juries of the first twenty-seven classes, one of the distinctions stated in Art. 1.

Art. 9.—The application of the preceding rules is left to the judgment of the International Jury, and to the interpretation of the Council of Presidents and Vice-Presidents.

In doubtful cases, appeal may be made, but only by members of the jury, from the decisions of the groups, to the Council of Presidents and Vice-Presidents, whose decision will be final.

Art. 10.—Independently of the rewards to be given by the jury, We reserve to Ourselves, on the recommendation of the Council of Presidents and Vice-Presidents of the first twenty-seven classes, to grant special marks of public gratitude to the exhibitors who may be pointed out to Us for extraordinary services rendered to civilization, to humanity, to science, or art; or encouragement of another kind, on account of considerable sacrifices for the general good, duly considering the position of the persons thus recommended.

Special Arrangements relative to the Fine Arts.

Art. 11. The rewards to be given by the three classes of the jury for the fine arts are the following:— Rewards to exhibitors of works of Fine Art.

1. A first-class medal, in gold.
2. A second-class medal, in gold.
3. A third-class medal, in gold.
4. Honourable mention.

Art. 12.—Besides the rewards mentioned in the above Art. 11, a great medal of honour, of the value of 5,000f. may be awarded in each of the three fine art classes to the artists who may distinguish themselves by works of brilliant merit.

The great medals of honour can only be given by the general verdict of the members of the three classes of the fine art jury.

Art. 13.—The number of medals of honour, and that of the medals to be given by each class of the fine art jury, will be fixed by the President of the Imperial Commission, on the proposition of the president of the eighth group, after a discussion at a general meeting of the members of the three classes composing it.

Art. 14.—The total value of the rewards to be granted by the fine art jurors may amount to the sum of 150,000f.

Art. 15.—Independently of the rewards to be given by the fine art jurors, We reserve to Ourselves, on the recommendation of a general meeting of the jurors of the three classes, to grant special marks of public gratitude to the artists exhibiting, who may be pointed out to Us for their extraordinary merit, or for great services rendered to the arts.

Art. 16.—Our Ministers of State and of Agriculture, Commerce, and Public Works, are charged with the execution of the present Decree.

Given at the Palace of the Tuileries, the 10th of May 1855.

(Signed) Napoleon.

(Countersigned) Achille Fould, Minister of State.

SPECIAL REGULATIONS FOR THE GUIDANCE OF THE INTERNATIONAL JURY.

The Imperial Commission for the Universal Exhibition, having under consideration the 63rd Article of the General Regulations, has decided on the following as the basis of the operations of the International Jury:

Regulations for the guidance of jury.

Art. 1.—Immediately after their arrival in Paris, the French and Foreign Members of the International Jury will repair to the Office of the Secretary of the Jury for the purpose of receiving all necessary information.

Art. 2.—The Members of the Jury will assemble on the 15th June,* in Classes, according to the division made by the Imperial Commission.

Election of Vice-President;

Art. 3.—At the first meeting of each class, the Members will elect from among themselves a Vice-President, who shall assist the President, and replace him in his absence. The Vice-Presidents of the first 27 classes will sit with the Presidents at the Council of Presidents.

reporter and secretary.

Art. 4.—One or more reporters, and a secretary, whose duty it will be to take notes of the results of the deliberations, will be likewise elected in each class.

Art. 5.—The same member may unite the functions of President or Vice-President and those of Reporter. One of the reporters, if he be not either President or Vice-President, may also add to his functions those of secretary.

Art. 6.—In the event of any Member not obtaining an absolute majority in the elections to be made in virtue of Arts. 3 and 4 above, the decision between the two candidates who obtain the greatest number of votes shall be by lot.

Art. 7.—The President of each class jury, and, in his absence, the vice-president, will have the casting vote.

Meeting of the jury.

Art. 8.—The place, day, and hour of each meeting of the class juries will be fixed by the President, and, in his absence, by the Vice-President. Notice will be given to the Secretary's Office, from whence summonses will be issued. The days of meeting will also be posted in the place where the jury sits and in the Secretary's Office.

Examination of the products.

Art. 9.—The products will be examined with the least possible delay by the different classes of the Jury in the manner in which they have been apportioned by the general classification.

Art. 10.—In the event of the products of an exhibitor being of a complex nature, and requiring the examination of several juries, the President of the jury in whose province such products are officially placed, will appoint mixed committees, composed of a certain number of the jurors of the different classes, competent to judge, each juror having a voice in the deliberations. The rewards proposed by the mixed committee will be presented and discussed before the group by the Jury of the class under which the products are arranged in the general classification.

* This meeting has since been postponed to the 25th June.

Art. 11.—In the event of the same exhibitor displaying different products appertaining to various classes, each product will be the object of a special examination by the class under which it has been placed by the system of classification.

Art. 12.—Each jury may, if necessary, divide itself into sub-committees; but it cannot come to a decision except by the majority of the entire jury.

Art. 13.—Each class-jury may take as a coadjutor, by the title of associate, or "*expert*," one or more persons specially acquainted with any object to be examined. These persons may be selected from among the titular or supplementary jurors of other classes, or from among men having the knowledge required, not being members of the juries.

Sub-committees.

Associates, or experts.

The members so associated will take no part in the labours of the class by which they may be called, beyond the definite object which was the cause of their being required; they will only have the right of discussion, without that of voting.

Art. 14.—Exhibitors who may have accepted the functions of jurors, whether they be titular or supplementary, will by that fact alone be debarred from competing for rewards.

Jurors cannot compete for rewards.

The Jury of the Fine Arts (8th Group, Classes 28, 29, and 30) is excepted from this rule.

Art. 15.—Exhibitors summoned either as associates or as "experts" will in like manner be excluded from competition, but only in the class in which they thus act.

Art. 16.—Foreign exhibitors discharging the functions of jurors may, by a special decision of the Section of Agriculture and Industry of the Imperial Commission, preserve their right of competing for prizes, but only in the classes in which they do not act as jurors.

Art. 17.—In the event of the prolonged absence of a titular juror in a class, steps will be taken for replacing him by one of the supplementary jurors. If the list of the supplementary jurors is exhausted, and if the number of members present, titular or supplementary, be less than the half, *plus* one, of the total of the titular members of which the class is composed, it shall be at once referred by the President, or, he failing, by the Vice-President, to that section of the Imperial Commission to which the class of the jury in which the vacancies occur is attached, to appoint one or more new members.

Provision for filling up vacancies.

Art. 18.—In the event of any nation which exhibits not having appointed the jurors which should represent it, or a sufficient number of jurors, the number will be filled up, by the general assembly of the jurors present in each class, out of a triple list prepared for this purpose by the Imperial Commission.

Art. 19.—Each of the first 27 classes of the Jury, after having examined the products of the exhibitors whose papers have been sent in, will draw up, by a majority of the members present, who must represent at least half, *plus* one, of the members of which the class is composed, a list of propositions for rewards, conforming themselves in this respect to the conditions of the Decree of 10th May 1855.

Each proposition will be accompanied by a succinct statement of the motives on which it is based.

Art. 20.—Any statements made by exhibitors which the jury may consider inaccurate may be returned by the President of the class to the Office of the Secretary of the Jury in order to be verified.

Statements of exhibitors.

Art 21.—The propositions for rewards drawn up by each of the first 27 Classes will be submitted to the revision of the general assembly of the group to which the class belongs.

Revision by the group.

The approval of the general assembly of the group will definitively confirm the rewards proposed by each of the classes composing it.

The definitive report must be remitted to the Office of the Secretary within 15 days after the rewards have been confirmed by the group.

Art. 22.—The members of the first 27 classes of the Jury may appeal against the decisions of the first 7 Groups to the council of the Presidents and Vice-Presidents, but only for violation of the conditions of the Decree of the 10th May 1855.

Appeals.

Art. 23.—In order to carry out Art. 21 above, the first 27 special juries shall meet together in a general assembly by groups formed in the following manner, in conformity to Arts. 16 and 67 of the General Regulations :—

Formation of groups.

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The 1st Group will be formed of a union of Classes			1 to 3
2nd Group	„	„	4 to 7
3rd Group	„	„	8 to 11
4th Group	„	„	12 to 14
5th Group	„	„	15 to 18
6th Group	„	„	19 to 23
7th Group	„	„	24 to 27

The members of each group will name their president and their vice-president, and designate one or more secretaries.

To each group will be attached an employé of the Secretary's Office, delegated by the Secretary of the International Jury to transcribe the proceedings and record the rewards on lists. These lists will be transmitted at the close of each sitting to the office of the secretary of the jury; they will be signed by the president or vice-president and by the secretary of the group.

Council of Presidents and Vice-Presidents;

Art. 24.—The rewards of the first order will not be given to the first 27 classes, except by the Council of Presidents and Vice-Presidents, on the proposition of the class juries, approved by the general assembly of the groups to which they belong.

Art. 25.—The Council of Presidents will be composed of the Presidents and Vice-Presidents of the Special Juries of the first 27 classes. It will be presided over by the President of the Imperial Commission, President-General of the Jury, and, in his absence, by one of the Vice-Presidents of the Imperial Commission, in the order fixed by the Imperial Decrees.

The Secretary of the International Jury will discharge the functions of Secretary to the Council of Presidents.

it duties.

Art. 26.—The Council of Presidents will adjudicate on the appeals which may be referred to it for the violation of the rules laid down by the Decree of 10th May 1855. It will agree to or refuse the rewards of the first order proposed by the classes and approved of by the groups. Finally, it will have the power of recommending to the Emperor those exhibitors who may appear to merit special marks of public gratitude on account of extraordinary services rendered to civilization, to humanity, to science, and the fine arts, or encouragement of any other kind on account of considerable sacrifices rendered to the cause of general usefulness, having regard to the position of inventors and producers.

Special Arrangements relative to the Fine Arts.

Jury for the Fine Arts.

Art. 27.—Each of the three classes of the jury for the fine arts will separately examine the works exhibited, paying due attention to Articles 12 and 15 of the Decree on Rewards and to Article 32 below.

Art. 28.—After a first examination, and before designating the names proposed for reward, a general meeting of the three classes will discuss the proposals to be submitted by the President of each class to the President of the Imperial Commission, in order to determine the number of medals of honour and of the medals of the 1st, 2nd, and 3rd class, in conformity with Article 13 of the Decree of 10th May 1855.

Art. 29.—The examination being ended, each class will point out by balloting those of the artists exhibiting whom they consider worthy of one of the rewards instituted by Article 11 of the Decree of the 10th May 1855.

Art. 30.—The lists of the classes will be formed by making an abstract of the private list drawn up by each juror, indicating the name of the artist, his specialty, and the nature of the reward proposed, without, however, exceeding the limits of the number which will be determined by the President of the Imperial Commission, in conformity with Article 13 of the Decree of the 10th May 1855.

Art. 31.—The rewards determined by Article 11 of the Decree of the 10th May 1855 will be voted definitively by each class of the jury of the fine arts without revision by the group.

Art. 32.—After the termination of their particular work, the jurors of the three classes of the fine arts will meet in general assembly to award the great medals allotted to each class, and to determine upon the list of artists exhibiting whom they consider worthy of being recommended to the Emperor to receive special marks of public gratitude, on account of extraordinary merit, or of great services rendered to the Arts.

(III.)

DECREES.

Supplemental Decree on rewards to exhibitors, and to foremen, workmen, &c.

In consequence of a report presented to the Emperor by Prince Napoleon, the President of the Imperial Commission, recommending that the designation of the medals to be awarded by the International Jury, which had been fixed by the Decree of the 10th May 1855, should be changed, in order that these awards should be quite distinct from those which had been given in various countries at the close of national or local exhibitions, the following Decree was issued :—

Napoleon, by the grace of God, and the national will, Emperor of the French, to all whom it may concern, greeting :

Considering Article 59 of the Decree of the 6th of April 1854, and Articles 1 and 8 of the Decree of the 10th of May 1855, on the proposition of the President of the Imperial Commission ;

We have decreed and do hereby decree, as follows :

Art. 1.—The mixed International Jury for the section of Agriculture and Industry is definitely formed and divided.

Art. 2.—The rewards to be given at the close of the Universal Exhibition by the first 27 Classes of the mixed International Jury, are as follows : the Great Medal of Honour, the Medal of the first class, the Medal of the second class, Honourable Mention. The Great Medal of Honour may be exceptionally granted in a collective manner to industrial groups of great importance which have attained a high degree of perfection, when no exhibitor of similar objects, without distinction of the country to which he belongs, has been found superior to his brother-exhibitors, and when, therefore, no Great Medal of Honour has been given to any individual in the same branch of industry. When a Great Medal of Honour is thus voted in a collective form, the jury will designate by name, if possible, the exhibitors whose collective merit has entitled their group to this high distinction.

Art. 3.—The rewards enumerated in Art. 2 will also be granted by the first 27 classes of the jury, to the principal workmen in Agriculture and Industry, to foremen, designers, chemists, engineers, superintendents, inventors, &c., who may distinguish themselves by a useful and intelligent co-operation.

Art. 4.—Our well-beloved cousin, Prince Napoleon, President of the Imperial Commission, our Minister of State, and our Minister of Agriculture, of Commerce and Public Works, are charged with the execution of the present Decree.

Given at the Palace of the Tuileries, the 3rd of October 1855.

(Signed) Napoleon.

(Countersigned) Achille Fould, Minister of State.
E. Rouher, Minister, Secretary of State in the department of Agriculture, Commerce, and Public Works.

On the 11th of November 1855, the President of the Imperial Commission addressed another report to the Emperor, informing him that the Council of Presidents had judged it necessary to appoint a committee of seven jurors selected from among their own body to reconsider the awards of the various juries, and to come to a final decision. At the same time he recommended that the gold medals should be of two kinds ; the first, under the name of Great Medal of Honour, to be given in cases of extraordinary and exceptional merit ; the second, under the name of Medal of Honour, to be given in remarkable cases, which, however, might not bear to the same extent as the former cases the stamp of inventive genius, or great usefulness. The following Decree was then issued :

Decree on Great Medals of Honour and Medals of Honour.

Napoleon, by the grace of God, and the national will, Emperor of the French, to all whom it may concern greeting :

Considering Article 59 of the Decree of the 6th of April 1854 ;

Considering Article 1 of the Decree of the 10th of May 1855, and Articles 2 and 3 of the Decree of the 3rd October 1855, on the proposition of the President of the Imperial Commission, and of the Council of Presidents and Vice-Presidents ;

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We have decreed and do hereby decree, as follows :

Art. 1.—Exhibitors in the sections of agriculture and industry, or the groups and great industrial centres to which they belong, as well as the co-operators and workmen in the branches of agriculture and industry, who may have been proposed for the Great Medal of Honour by one of the classes of the jury, with the approbation of the group of which each class forms a part, may receive from the Council of Presidents and Vice-Presidents either the Great Medal of Honour or the Medal of Honour.

Art. 2.—The Medal of Honour awarded to groups or great centres of industry in a collective manner will be completely anonymous, and no individual may claim the merit of it for himself.

Art. 3.—The regulations made by the Decrees of the 10th May and the 3rd of October 1855, which are not modified by the present Decree, will remain in full force.

Art. 4.—Our well-beloved cousin, Prince Napoleon, President of the Imperial Commission and of the Council of Presidents and Vice-Presidents, our Minister of State, and our Minister of Agriculture, Commerce, and Public Works, are charged with the execution of the present Decree.

Given at the Palace of Saint Cloud, the 11th of November 1855.

(Signed) Napoleon.

(Countersigned) Achille Fould, Minister of State.
E. Rouher, Minister, Secretary of State in the Department of Agriculture, Commerce, and Public Works.

(IV.)

SUMMARY OF THE CONDITIONS UPON WHICH THE EXHIBITION WILL BE CONDUCTED.

The Decrees and Regulations issued by the Imperial Commission of France give full information as to the principles upon which the Imperial Government propose to conduct the Exhibition of 1855, and an attentive perusal of them is recommended to all those who desire to co-operate in securing a fair representation of British industry on that occasion; but it may be useful to sum up the principal conditions, showing the assistance offered to exhibitors by the French Commission, and that which the British authorities are empowered to offer :—

General Regulations issued by the Board of Trade.

1. The Exhibition will open in Paris on the 1st May 1855.

2. The French Commission will communicate only with exhibitors from foreign countries through the Commission appointed by each country for that purpose.

3. No articles will be admitted from foreign countries except with the sanction of such foreign Commission.

4. Every article produced or obtained by human industry, whether of raw materials, machinery, manufactures, or Fine Arts, is admissible, except,—

i. Living animals and plants.
ii. Substances liable to become putrid from keeping.
iii. Detonating and other dangerous substances.
iv. Articles of the same description in extravagant quantity.

5. All goods must reach Paris between the 15th January and 15th March 1855, which period may, in a few exceptional cases, be extended to the 15th April.

6. The French Commission offers to convey all goods from the French ports or frontiers to the building in Paris without charge.

7. No charge will be made for rent.

8. Exhibitors and their agents will be admitted free to the building during the whole period of the Exhibition.

9. Plain counters and partitions will be provided without charge.

10. The French Commission will find labourers for unpacking, transporting, and arranging goods under the direction of exhibitors or their agents.

11. The French Commission will provide shafting, steam, or water-pressure for machines in motion.

12. Exhibitors will be responsible for accidents, loss, or damage, but the fullest precautions are promised against such events.

13. The current trade price may be affixed to any goods, if the exhibitors desire it.

14. Goods may be exhibited in bond, and no duty will be charged if re-exported.

15. Exhibited goods, even those at present prohibited by the French tariff, may be admitted for consumption in France at a maximum ad valorem duty of 20 per cent.

16. Arrangements will be made to ensure one year's protection to designs and inventions if exhibited, without cost to the exhibitor.

17. The goods will be examined by an international Jury, and rewards given, the nature of which will be published.

Arrangements made by the British Government.

18. The British Government will undertake all expenses of general organization and management, and will defray the expenses of the transport from London, and Custom-house agency, of all goods delivered within a specified time.

19. A sufficient staff will be provided for giving that attention to the goods of exhibitors which was undertaken by the Commissioners for the Exhibition of 1851.

20. The expenses which must in every case fall upon exhibitors will be—

i. The carriage of the goods from the manufactory or residence of the exhibitor to London.

ii. The expense of glass-cases, shelves, brackets, awnings, hangings, or decorations of the stalls, which must be undertaken under such restrictions as the officers of the French Commission may impose for the sake of the general arrangements or appearance of the Exhibition.

iii. The unpacking, arrangement, and general care of the goods during the Exhibition, except as far as provided by paragraph 19.

21. The period named as the latest at which demands for space could be received was the 1st August, but a small reserve has been made for completing those departments which appeared, upon examination, to be inadequately represented.

22. The measures for conducting the British department of the Exhibition have been entrusted to the Board of Trade, Department of Science and Art.

Department of Science and Art,
Marlborough House, Pall Mall, London,
1st Nov. 1854.

ARRANGEMENTS FOR SHIPPING GOODS.

Marlborough House, London, 2nd Feb. 1855.

Shipment from London.

I. Messrs. Lightly and Simon, of 123, Fenchurch Street, are appointed agents to receive goods for shipment to Paris, at the Irongate Wharf, Tower, London. Dunkirk is the French port to which Messrs. Lightly and Simon will ship goods consigned to them.

Rotation number and address.

II. The official rotation number ticket (to be furnished by this department) must be filled up according to the directions given in Clause III., and be firmly attached to the packages. Each package must have one such rotation number ticket on the outside, and another on the inside, for the purpose of facilitating the return of the empty packing-case at the close of the Exhibition.

III. Every rotation number ticket must be filled up distinctly, in the blank spaces left for that purpose, as follows :—

1. The rotation number of the exhibitor.
2. The exhibitor's mark (or initials) and a number.
   [A single package to be Number 1, and each additional package to be numbered progressively from 1 upwards.]
3. The gross weight of the package.
4. The name and address of the exhibitor.
   [Packages with addresses wanting in any of these particulars will be liable to rejection by the shipping agents.]

Mr. Cole on the General Management.

IV. All packages and parts of machinery not exceeding three tons weight each must be delivered, free of charge, to Messrs. Lightly and Simon, at Irongate Wharf, Tower, London; but such as exceed that weight are not to be forwarded until the exhibitor shall have communicated with Messrs. Lightly and Simon, and received from them directions for their delivery at the Wharf or elsewhere, as circumstances may render necessary. No charge will be made to exhibitors for the reception, shipment, or transport of goods to Paris, for their carriage to the Exhibition buildings, or for housing the empty packing-cases at Paris.

Appendix A.

Weight.

Advices.

V. The exhibitors must fill up two advices (No. 91) notifying the despatch of their goods,—one to be sent to Marlborough House, the other to Messrs. Lightly and Simon, 123, Fenchurch Street, London.

Shipment from another port.

VI. Exhibitors resident in Ireland or to the north of Chester, who may find it more convenient, on account of bulk, to ship their machinery or heavy goods themselves from any other port than London, must make a special application for permission to do so to the Secretary for the Paris Exhibition, on or before the 10th February 1855, naming the British port they propose to ship from, and stating which of the following French ports they prefer to ship to, namely, Havre or Dunkirk. The date when the shipment will be made must also be given. The goods must be delivered at the French port selected by the exhibitor on or before the 10th of March.

Allowance.

In these special cases, the Board of Trade, instead of paying the charges of transport, has authorized an allowance to be made to the exhibitors at the following rates :—

	s.	*d.*	
All goods and machinery up to 3 tons weight per packet (inclusive)	67	6	per ton.
From 3 tons to 10 tons per package (inclusive) . .	72	6	„
From 10 ton to 30 tons per package (inclusive) . .	75	0	„

This allowance is to cover all expenses to the French port of discharge, and will only be paid upon the delivery by the exhibitor of a voucher, certifying that the arrival of his goods took place at the said French port on or before the 10th March 1855.

The Regulations of the Imperial Commission

Direct that all goods must reach Paris between the 15th January and 15th March 1855, which period may, in a few exceptional cases, such as Silks and Jewellery, be extended to the 15th April.

Francis Fowke, Capt. R.E.,
Secretary.

CLOSING OF THE EXHIBITION.

British Executive.

1. It is officially announced that the Exhibition, in all its parts, will finally close on Thursday, 15th November, when the prizes will be distributed.

2. Exhibitors who desire to be present at the ceremony of the distribution of the prizes are requested to inform Captain Fowke, the secretary, accordingly on or before 1st of November.

Distribution of the prizes.

3. To prepare for the distribution, the nave of the Palais de l'Industrie will be closed on 1st November, and measures taken to have this portion of the building cleared of all goods, glass-cases, &c., as quickly as possible. British exhibitors and their agents are therefore requested to show their hearty co-operation with the Imperial Commission, and commence the removal of their goods and glass-cases, &c., from the nave, punctually on the morning of the 1st November at 7 A.M.

4. The articles in the nave, if sold, must be taken out of the building, and if to be returned to England, must be packed by the exhibitors or their agents and forthwith despatched.

Return of goods to London.

5. The carriage of articles to be returned will be paid by the Imperial Commission and the Board of Trade respectively, as far as London, provided the

Appendix A

articles are properly re-packed before 8th December; but the Board of Trade will not pay the carriage to London of empty packing-cases or any glass-cases without special permission. The articles returned will be shipped to the care of Messrs. Lightly and Simon, Irongate Wharf, Tower, London, who will immediately forward them by the usual mode to their addresses, unless the exhibitors advise Messrs. Lightly and Simon to the contrary. The charges for carriage from Irongate Wharf must be borne by exhibitors.

6. The whole work of re-packing must be done by the exhibitors or their agents, and if the articles are not re-packed on or before the 8th December the charges for the carriage, &c., must be borne by the exhibitors themselves.

7. Empty packing-cases left in the Exhibition building after the 8th December will be liable to be confiscated and sold to pay expenses.

Close of Offices.

8. The offices of the British Commission will be closed for the transaction of business as soon as possible after the 8th December. No letters of exhibitors should be addressed there after that day, or they will be liable to be returned. All communications should then be sent to Marlborough House, Pall Mall, London.

Customs.

9. The Manutention du Commerce de Paris, through M. Moreno, are prepared to give every assistance at reasonable charges, in passing through the Customs, goods either sold or to be returned to England; and exhibitors are recommended to avail themselves of the facilities offered, and to prepare at once their lists of sales and articles to be returned, so that the lists may be completed before the 1st November, if possible. M. Moreno is recognized by the Imperial Commission, and his office is at the north-east corner of the Palais de l'Industrie.

FRANCIS FOWKE, Capt. R.E.,
Secretary.

Paris, 17th October 1855.

Appendix B.

APPENDIX (B).

LETTER addressed by the BOARD OF TRADE to H.I.H. PRINCE NAPOLEON, PRESIDENT of the IMPERIAL COMMISSION, when the Duties of the BRITISH COMMISSION ceased.

Department of Science and Art, Marlborough House,
London, 9th February 1856.

SIR,

Letter addressed by the Board of Trade to Prince Napoleon at the close of the Exhibition.

THE relations which have been established between the Imperial Commission for the Universal Exhibition of 1855, and the Lords of the Committee of Privy Council for Trade having nearly arrived at their conclusion, I am directed by their Lordships to express to your Imperial Highness their high sense of the success with which the Imperial Commission has carried out the arduous duties of the late Universal Exhibition, and especially of the very great assistance which my Lords have uniformly received from your Imperial Highness as President. Their Lordships feel that their Officers and the British Exhibitors have reason to remember gratefully the generous aid which your Imperial Highness afforded on all occasions in the solution of many difficulties.

My Lords direct me to request your Imperial Highness to express their thanks to the several Officers of the Imperial Commission who carried its orders into execution, for their hearty co-operation, and particularly to the Secretary-General M. Arlès Dufour, the Commissioner-General M. Le Play, and M. de Mercey, the Special Commissioner for the Beaux Arts.

In the difficult administration of the exceptional tariff on articles hitherto actually or partially prohibited, which was established for the first time by His Majesty the Emperor, to facilitate the holding of a Universal Exhibition, their Lordships consider that especial thanks are due to M. Desseche and the other Officers of the Customs.

Mr. Cole on the General Management.

Appendix B.

My Lords further direct me to request your Imperial Highness to acknowledge on their behalf the manner in which the Commissioner of Police, M. Courteille, executed his delicate office in the British portion of the Exhibition.

My Lords have had great satisfaction in having acted on behalf of Her Majesty's Government on this occasion, and they venture to hope that the new connexions which the French Exhibition has been the means of forming between the two countries, may be extended and cemented, and may confer reciprocal benefits on the people of both nations.

I have the honour to be, &c.

His Imperial Highness
Prince Napoleon.

HENRY COLE.

Appendix C.

APPENDIX (C.)

AN ESTIMATE of the SUM required to be VOTED in the Year 1854, ending 31st March 1855, for EXPENSES to be incurred for the MANAGEMENT of the BRITISH DEPARTMENT of the UNIVERSAL EXHIBITION at PARIS in 1855.

FIFTY THOUSAND POUNDS.

NOTE.—The following CORRESPONDENCE explains in detail the objects to which the proposed Vote is to be applied.

(No. 1.)

Department of Science and Art, Marlborough House,
19th May 1854.

SIR,

Letter from the Board of Trade submitting the Estimate to the Treasury.

I AM directed by the Lords of the Committee of Privy Council for Trade to transmit an estimate of management of the British portion of the Universal Exhibition to be held at Paris in 1855; and I am to state for the consideration of the Lords Commissioners of Her Majesty's Treasury, that upon receipt of the general regulations for conducting the Paris Exhibition, which were transmitted by Lord Clarendon to this Department, their Lordships lost no time in procuring the information necessary for the preparation of this estimate.

My Lords have reason to believe that the Paris Exhibition will be divided into three parts; one to be included in the large stone building now in course of erection, in which it is estimated that about 80,000 square feet will be allotted to British produce and manufactures; the second division will consist of machinery, and the third of fine arts, for both of which it is proposed to erect adjacent temporary buildings. The space to be allotted to machinery, as well as to fine arts, will be in proportion to the demands made. The first division will be arranged in twenty-three classes, or six groups, whilst the division of machinery will have four classes. In order to fill the space assigned to British exhibitors with a complete exhibition of industry in each class, and to subdivide the space among the candidates for it, it will be necessary to provide superintendents, with proper clerical assistance, for these groups. Upon the data furnished by the Exhibition of 1851, it is estimated that the expense of this preliminary work will amount to 3,700*l.*

It will be seen by the Regulations of the French Commission (Article 20), that the cost of paying the transport of all articles whatever from the French port of arrival to the building in Paris, has been liberally undertaken by the French Government; and with a view of promoting punctuality in British exhibitors, my Lords consider that it would be advisable to offer to pay the transport of articles from a given spot in London to the French port, provided

they were delivered within the specified time. For this service, for Customs charges at the French port, and for assisting in unpacking goods at Paris, it is estimated that 2,750*l.* will be required.*

It will be necessary to provide an office and management in Paris during the period of the Exhibition, which is estimated to cost 3,375*l.* The cost of glass cases and fittings will be placed upon exhibitors; but to whatever extent this may be borne by exhibitors, there will certainly be some charges under this head for the completion of the Exhibition and its general decoration which exhibitors will not bear, and which cannot be estimated at less than 5,000*l.*

Proper maintenance, cleaning, and watching of the Exhibition itself will have to be ensured, and a sum of 5,200*l.* may be necessary for this item, besides a sum of 1,500*l.* for the cost of removing and warehousing the packing-cases of exhibitors, and for general assistance in re-packing at the termination of the Exhibition. In addition to these specific charges, there will be general expenses for printing and advertising, postage, stationery, clerkship, and incidents, which may be estimated at 3,800*l.*; and it will probably be found necessary, in order to secure a proper representation of raw materials and produce, to incur an expenditure of 2,000*l.* It appears, therefore, that a sum of 27,325*l.* would be necessary to ensure a successful representation of British Industry, and to provide effectually for that kind of service which cannot be expected from exhibitors or voluntary subscribers, and is analogous to that which was borne by the Commissioners of the Exhibition of 1851.

It has been observed already that a third division of the Paris Exhibition will consist of Fine Arts. This will constitute one of its distinguishing features, and will form not the least interesting part of it. But as it is one in which neither artists nor the proprietors of works of art can be expected to bear any portion of those expenses which manufacturers will undertake, it will be necessary that the whole expenses should be borne by a central administration, to enable it to offer such assistance to exhibitors as may induce them to co-operate in promoting an Exhibition of Fine Arts worthy of the country. The Art Superintendent is of opinion that if proper provision were made for bearing the expenses of forwarding pictures and works of art, and ensuring their safe return, an exhibition most creditable to the national talent might be sent to Paris. The expenditure on this head is estimated at 5,055*l.*†

It will be seen by the Regulations of the French Commission that juries are to be appointed and awards made. It will be indispensable that the services of the most distinguished professional men should be engaged to perform this onerous and delicate duty; they will have to reside for some weeks at Paris, and cannot be expected to do so at their own expense. It will therefore be necessary to pay for their services, and for the preparation and printing their reports, &c.; and a lower estimate than 11,250*l.* ought not to be made.

Considering the untried nature of the business to be undertaken, and having regard to the cost, namely, 68,000*l.*, which the French Government are stated to have incurred in exhibiting French industry in this country in 1851, although pictures were excluded, my Lords have deemed it prudent to add 20 per cent. for contingencies to all these items; making a total estimate of 52,356*l.*‡ Their Lordships consider that by careful and judicious management the expenditure may be kept within these limits, and that no increase beyond the sums named should take place without the special authority of the Lords Commissioners of Her Majesty's Treasury.

As no time ought to be lost in issuing General Regulations for British exhibitors, and ascertaining the willingness of the principal producers to exhibit, an immediate decision is of great importance. With the view, therefore, of commencing the preparations for filling the space already mentioned, of

* This sum did not provide for the payment of the transport back. It was based upon the amount paid by France in 1851, but owing to the greater weight and quantity of the goods sent than was expected, the estimate was insufficient. The sum paid for the transport of the goods sent and returned was 7,531*l.* 2*s.* 11*d.*

† The payments on behalf of the Fine Arts have been 5,202*l.* 11*s.* 2*d.*, exclusive of the cost of transport to and from Paris.

‡ Only 50,000*l.* was voted, and notwithstanding the excess of expenditure over the estimate for transport and for Fine Arts, the total expenditure will not exceed 40,000*l.*

Mr. Cole on the General Management.

Appendix C.

announcing to intending exhibitors that the transport of their goods to a French port will be paid, of providing for printing, and general office expenses, and of ensuring a proper representation of a raw produce, as well as for the exhibition of the Fine Arts, their Lordships have to suggest that the Lords Commissioners of Her Majesty's Treasury should sanction at once an expenditure not exceeding 12,250*l.* for the Industrial Division, and 5,000*l.* for the Fine Arts.

I have, &c.

The Secretary, Her Majesty's Treasury. (Signed) Henry Cole.

(No. 2.)

Copy of Treasury Minute, dated 26th May 1854.

Treasury Minute.

Write to Mr. Cole, that my Lords approve generally of the arrangements proposed for the management of the British portion of the Universal Exhibition in Paris in 1855; but before giving their sanction to the appropriation of specific sums to the different purposes referred to herein, or to an immediate expenditure for such purposes, their Lordships would wish to be furnished with a more detailed and complete account of the manner in which it is intended to carry out the object in view.

(No. 3.)

Department of Science and Art, Marlborough House,
31st May 1854.

Sir,

Letter transmitting the Minute of the Board of Trade to the Treasury.

I am directed by the Lords of the Committee of Privy Council for Trade to acknowledge the receipt of your letter of the 26th May, by which you acquaint me that the Lords Commissioners of Her Majesty's Treasury approve generally of the arrangements proposed for the management of the British portion of the Exhibition, and wish to be furnished with a more detailed and complete account of the manner in which it is intended to carry out the object in view.

My Lords desire me to state, that the first steps to be taken will be to ascertain by personal inquiries in the manufacturing districts, and by correspondence, the willingness of producers to exhibit, and the amount of space likely to be required by them; also to ascertain what works of Fine Art the proprietors of them will be disposed to lend to the Government for exhibition in Paris. It is proposed to procure the assistance of competent persons to obtain and methodise this information, whose engagements will be from month to month only. It was estimated that the cost of these inquiries, and the action to be hereafter taken upon them, would entail an expenditure of 10,250*l.* for the Industrial, and 5,055*l.* for the Fine Arts branch; but it should be stated, that this total cost would not be ascertained until the close of the Exhibition, or the outlay positively incurred. It is also proposed to incur an expense, if found to be necessary, of 2,000*l.*, for ensuring the representation of the raw produce of the country, for which measures should be taken forthwith.

For the purpose of conducting this business, my Lords have passed a Minute, a copy of which I am directed to enclose for the information of the Lords Commissioners of Her Majesty's Treasury (See No. 4.), and I am to request that they will give their sanction to the arrangements proposed, and direct the Paymaster-General to advance the sum of 3,000*l.* upon an order signed by the parties named in the Minute.

I have, &c.

The Secretary, Her Majesty's Treasury. (Signed) Henry Cole.

Appendix C.

(No. 4.)

Department of Science and Art.

My Lords have under consideration the preliminary arrangements necessary for assisting in the French Exhibition of 1855.

The Secretaries will visit the principal seats of industry in the provinces, and will make such arrangements as can be made in the present state of the correspondence with the Treasury, with a view to carry into effect the objects set forth in the letter of this Board of the 19th May. Board of Trade Minute.

Mr. Redgrave will, so soon as the further answer from the Treasury is received, submit to the Board the arrangements which he thinks necessary for the Exhibition of Fine Arts.

To ensure that promptness of action which is indispensable to success in an undertaking of this character, the following are to be the general arrangements for transacting the financial and other business. From time to time the Board will pass Minutes directing applications to the Treasury for such imprests as they may think necessary, to be drawn upon the Paymaster-General. The money is to be paid into a bank in the names of the Secretaries and Mr. Redgrave and Captain Owen, and drawn out upon their orders by cheques, signed by either of the Secretaries, or by Mr. Redgrave, countersigned in each case by Captain Owen. Captain Owen will have the assistance of Mr. Mayo in the superintendence and control of the accounts.

All engagements are to be made from month to month, and all accounts are to be paid and audited monthly, and charged to the heads of the estimate as sanctioned by the Treasury. No liabilities exceeding 50*l.* for each separate account are to be incurred without first obtaining the authority of the Board, in all cases where possible. Printing and stationery may be obtained otherwise than through the Stationery Office, and works may be ordered without application to the Office of Works, contracts for outlays exceeding 50*l.* being first obtained, as far as may be practicable. At the termination of the Exhibition, the accounts, with proper vouchers, are to be sent to the Audit Office.

The correspondence with the French Commission and exhibitors will be conducted for the present by Captain Owen, R.E., in the name of this department, under the orders of my Lords, communicated to him by the secretaries.

Let a copy of this Minute be sent to the Treasury, with a request that the Lords Commissioners will direct an imprest of 3,000*l.* to be made for the purpose of giving effect to this minute.

(No. 5.)

Copy of Treasury Minute, 2nd June 1854.

Direct the Paymaster-General to pay to H. Cole, Esq., C.B., and Dr. Lyon Playfair, C.B., Joint Secretaries of the Department of Science and Art, the sum of 3,000*l.* to defray the expenses of certain preliminary arrangements undertaken by that department, for the management of the British portion of the Industrial Exhibition to be held in Paris in the year 1855, and to charge the same to Civil Contingencies, as an advance to be hereafter repaid. Acquaint Mr. Cole, and state that my Lords sanction the arrangements herein proposed. Treasury Minute.

Mr. Cole on the General Management.

APPENDIX (D.)

BOARD OF TRADE (DEPARTMENT OF SCIENCE AND ART).

Appendix D.

THE RIGHT HONOURABLE THE LORDS OF THE COMMITTEE OF PRIVY COUNCIL FOR TRADE.

Officers employed on the Paris Exhibition.

Staff of officers.

Henry Cole, Esq., C.B., General Commissioner.
Richard Redgrave, Esq., R.A., Special Commissioner for Fine Arts.
Francis Fowke, Captain R.E., Secretary.
George Francis Duncombe, Esq., Assistant Secretary.
Richard A. Thompson, Esq., Superintendent for Arrangement.
Philip C. Owen, Esq., Deputy Superintendent for Arrangement.
C. S. Parker, Esq., Assistant for the Fine Arts.
C. Thurston Thompson, Esq., Henry Sandham, Esq., and Edward Hall, Esq., Assistants for Arrangement.
Falconer Atlee, Esq., Inspector for the Admission of Goods. Assistant, Mr. Edmund Joy.
William Matchwick, Esq., Financial Clerk. Assistant Clerks, Mr. C. G. Quinton, Mr. Henry Gasparini. Sergeant Jenkins; Corporals Key, Mack, and Clabby; Privates Kelly and Hart, Royal Sappers and Miners.
Mr. Harris, Messenger. Mrs. Harris, Housekeeper.

Offices:—14 Rue du Cirque.

Colonial Commissioners:—

Commissioners and Agents for British Colonies.

Australia.

AUSTRALIA—Sydney:

William M'Arthur, Commissioner.
E. D. Thomson, „
M. H. Marsh, „
Fred. Bousfield, Secretary.
M. Doc, of the firm of MM. Desgrands et fils, 35, Rue de l'Entrepôt, Agent.

Victoria:

Edward Bell, Commissioner.
Narcisse Domis, 36, Rue de la Paix, Batignolles, Agent.

Bahamas.

BAHAMAS:

Lightly and Simon, Agents in London (123, Fenchurch Street).

Barbadoes.

BARBADOES:

Thomas Hill, Agent in London (126, Piccadilly).

British Guiana.

BRITISH GUIANA:

W. H. Holmes, Commissioner (67, Victoria Street, Westminster).

Canada.

CANADA:

J. C. Taché, Commissioner.
W. E. Logan, „ 35, Avenue d'Antin.
W. H. Boulton, Honorary Commissioner, 14, Rue du Dauphin.
Hector Bossange, „ 25, Quai Voltaire.
R. Forsyth Maitland, „ 21, Avenue des Champs Elysées.
Donald Bethune, „
Robert Smiley, „
James Beaty, „
A. de Puibusque, „ 52, Rue de Bourgogne.
A. Perry, Curator.
W. Chapman, Agent in London (21, Old Broad Street).

CAPE OF GOOD HOPE: Cape of Good Hope.

J. R. Thomson and Harrison Watson, Commissioners (St. Peter's Chambers, Cornhill, London).

CEYLON: Ceylon.

Capt. H. Layard, Commissioner.
G. Baillie, Agent in London (5, Cannon Row, Westminster).

INDIA: India.

Chairman and Directors of the Hon. East India Company, Commissioners.
Dr. J. Forbes Royle, F.R.S., Special Commissioner, East India House.
Dr. P. H. Green, „

JAMAICA: Jamaica.

A. Ridgway, Agent in London (42, Leicester Square).
E. Fremont, 28, Rue Trevise, Agent in Paris.

MAURITIUS: Mauritius.

J. Morris, Agent in London (8, Great Ormond Street, Queen's Square).
M. Aubin, 45, Rue du Luxembourg, Agent in Paris.
M. Husson, 11, Rue Rumfort, „

NOVA SCOTIA: Nova Scotia.

Mr. Archibald, Agent in London (Conservative Club).

NEW ZEALAND. New Zealand.

A. Ridgway, Agent in London (42, Leicester Square).
E. Fremont, Agent in Paris (28, Rue Trevise).

VAN DIEMEN'S LAND: Van Diemen's Land.

R. W. Nutt, Commissioner.
F. A. Ducroz, Agent in London.
J. Gibson. „
M. Steiner, Agent in Paris (35, Rue de l'Entrepôt).

List of Agents for Exhibitors of the United Kingdom. Agents for Exhibitors and Committees.

Bennett, H., Hotel Folkestone, 9, Rue Castellane. Representing single Exhibitors.
Brandon, D., 21, Rue Gaillon. Representing Exhibitors.
Brown, J. G., 14, Rue du Cirque. Representing Sunderland Committee.
Cappe, E., 30, Rue Jean Goujon. Representing single Exhibitors.
Combes, E., 4, Rue Neuve des Mathurins. Representing Hull.
Desgands et fils, 35, Rue de l'Entrepôt. Representing Colonies and single Exhibitors.
Devlin, J. D., 14, Rue du Cirque. Representing the London Boot and Shoe Trade.
Dowson, J. E., 14, Rue du Cirque. Representing Aberdeen, Birmingham, Huddersfield, Kidderminster, Sheffield, Trowbridge, and Walsall Committees. Metropolitan Cabinet Makers, Carpet Makers, Chemists, and Curriers.
Fontaine-Moreau, M. de, 39, Rue de l'Echiquier. Representing single Exhibitors.
Harding, S., 18, Rue de l'Echiquier. Representing Glasgow Committee.
Hartman, J., 17, Rue Bleue. Representing the Leeds Woollen Exhibitors.
Henocque and Vamvers, 14, Rue Basse des Remparts. Representing Saddlery.
Hickling, M. Representing Nottingham.
Houston, J. M. and G. W., 14, Rue du Cirque. Representing Paisley Exhibitors.
Hunt and Heslop. Representing Exhibitors.
Murray, B. A., 41, Rue Miromenil. Representing Dublin Committee.
Murray, J. O., 14, Rue du Cirque. Representing Manchester Committee.

Mr. Cole on the General Management.

Appendix D.

Nourse and Company (through Mr. Yapp), 27, Boulevart des Italiens. Representing single Exhibitors.
Ryder, W. H., 14, Rue du Cirque. Representing Potteries Committee.
Saglier, V., 42, Rue des Jeûneurs. Representing single Exhibitors.
Simon, Theodore, 14, Rue du Cirque. Representing Class VIII.
Smith, R., and Howitt, G., 14, Rue du Cirque. Representing Bradford and Halifax.
Spiers, Frederick, 13, Rue de la Paix. Representing the Carriage Makers of London and the Provinces.
Stout, Stephen, 64, Rue de la Viile l'Evêque. Representing Colonies and single Exhibitors.
Sutton, William, 11, Rue St. Pierre, Montmartre. Representing Silk Manufacturers.

Appendix E.

APPENDIX (E.)

BRITISH JURORS.

British Jurors for the Industrial Division.

Class I.—MINING AND METALLURGY.

Jurors.

W. J. Hamilton, President of the Geological Society.
Warington Smyth, F.G.S., Professor of Mining and Mineralogy in the Government School of Mines, and Inspector of Mines to the Duchy of Cornwall.

Class II.—FORESTRY, &c.

Juror.

Sir W. Hooker, F.R.S., Director of the Royal Gardens, Kew.

Class III.—AGRICULTURE.

Juror.

J. Evelyn Denison, M.P., Member of the Royal Agricultural Society of England.

Supplementary Jurors.

John Wilson, F.R.S.E., Professor of Agriculture in the University of Edinburgh.
C. E. Amos, Consulting Engineer to the Royal Agricultural Society of England.

Class IV.—MACHINERY IN GENERAL AS APPLIED TO INDUSTRY.

Juror.

George Rennie, C.E., F.R.S.

Class V.—RAILWAY MACHINERY, COACHES, AND HARNESS.

Jurors.

T. R. Crampton, C,E., Engineer to the Submarine Telegraph between France and England, for Railway Machinery.
Rt. Hon. the Earl of Shelburne, M.P., for Carriages and Harness.

Class VI.—MACHINERY FOR WORKSHOPS.

Juror.

W. Fairbairn, C.E., F.R.S., Corresponding Member of the French Institute and Juror in 1851.

Class VII.—MACHINERY FOR WOVEN FABRICS.

Juror.

Rev. R. Willis, M.A., F.R.S., Professor of Natural Philosophy, Cambridge, and of Mechanics in the Government School of Mines, and Juror in 1851; aided by the Jurors for Woven Fabrics.

Class VIII.—ARTS RELATING TO THE EXACT SCIENCES, AND TO INSTRUCTION.

Jurors.

Sir David Brewster, F.R.S., Member of the French Institute, and Deputy-Chairman and Reporter of the Jury of Philosophical Instruments in 1851.

J. Carter, Alderman of the City of London, and Chairman of the Metropolitan Committee of Watch and Clockmakers.

Supplementary Juror.

Dr. Tyndal, F.R.S., Professor of Physics in the Royal Institution of Great Britain.

Class IX.—HEAT, LIGHT, AND ELECTRICITY.

Jurors.

C. Wheatstone, F.R.S., Professor of Experimental Philosophy, King's College, Corresponding Member of the French Institute.

Dr. Neil Arnott, F.R.S.

Class X.—CHEMICAL MANUFACTURES, INCLUDING PAPER.

Jurors.

Thomas Graham, F.R.S., Master of the Mint, Corresponding Member of the French Institute, and Deputy-Chairman and Reporter of the Chemical Jury in 1851.

Warren De la Rue, F.R.S., Reporter and Juror in the Exhibition of 1851.

Class XI.—ALIMENTARY SUBSTANCES.

Juror.

R. Owen, F.R.S., Corresponding Member of the French Institute, and Chairman of the Jury on Alimentary Substances in the Exhibition of 1851.

Class XII.—HYGIENE, PHARMACY, SURGERY, MEDICINE.

Jurors.

Sir Joseph Olliffe, Physician to the British Embassy in Paris.

Dr. Royle, F.R.S., Professor of Materia Medica in King's College, Scientific Referee to the H.E.I.C. on the Vegetable Substances of India, and Juror in 1851.

Supplementary Juror.

Edwin Chadwick, C.B., late Member of the General Board of Health.

Class XIII.—NAVAL AND MILITARY ARTS.

Jurors.

Lieutenant-General Sir John Burgoyne, G.C.B., Inspector-General of Fortifications, and Juror in 1851.

J. Scott Russell, F.R.S., Shipbuilder, late Secretary to the Royal Commission for the Exhibition of 1851.

Class XIV.—CIVIL ENGINEERING.

Juror.

Joseph Locke, C.E., M.P., F.R.S.

Supplementary Juror.

Charles Manby, C.E., Secretary to the Institution of Civil Engineers.

Class XV.—STEEL AND ITS PRODUCTS.

Juror.

T. Moulson, the Master Cutler of Sheffield.

Supplementary Juror.

J. J. Mechi, F.S.A., Juror in the Exhibition of 1851.

Class XVI.—GENERAL METAL WORK.

Jurors.

W. Bird, Deputy-Chairman of Jury on Iron in the Exhibition of 1851.
Alfred Tylor, F.G.S., Manufacturer in London.

Class XVII.—GOLDSMITHS' WORK, JEWELLERY, AND BRONZES.

Juror.

The Most Honorable the Marquis of Hertford, K.G.

Class XVIII.—GLASS AND POTTERY.

Jurors.

J. Hartley, Manufacturer of Glass in Sunderland, and Medallist in 1851.
J. Webb, Juror for Furniture in 1851.

Supplementary Juror.

Dr. Hofmann, F.R.S., Professor of Chemistry to the Government School of Mines, and Juror and Reporter in the Exhibition of 1851.

Class XIX.—COTTON PRINTING AND DYEING.

Jurors.

T. Bazley, President of the Chamber of Commerce, Manchester, one of Her Majesty's Commissioners for the Exhibition of 1851.
Walter Crum, F.R.S., Calico Printer and Bleacher, Glasgow.

Class XX.—WOOLLEN AND WORSTED MANUFACTURES.

Jurors.

S. Addington, Woollen Merchant, London, and Reporter of the Jury on Woollen Cloths in the Exhibition of 1851.
Richard S. Butterfield, Merchant, of Bradford, Yorkshire.

Class XXI.—SILK.

Juror.

T. F. Gibson, one of Her Majesty's Commissioners for the Exhibition of 1851.

Supplementary Juror.

T. Winkworth, Reporter to the Silk Jury in the Exhibition of 1851.

Class XXII.—FLAX AND HEMP.

Juror.

Erskine Beveridge, Linen Manufacturer, Dunfermline.

Supplementary Juror.

James MacAdam, jun., Secretary of the Royal Society for the Promotion and Improvement in the Growth of Flax in Ireland, and Honorary Secretary to the Belfast Committee for the French Exhibition.

Class XXIII.—HOSIERY, CARPETS, &c.

Jurors

W. Felkin, Chairman of Jury on Clothing in 1851.
Peter Graham, Upholsterer, and Juror in 1851.

Class XXIV.—FURNITURE AND DECORATION.

Jurors.

His Grace the Duke of Hamilton.
Digby Wyatt, Architect, Secretary to the Executive Committee of the Exhibition of 1851.

Class XXV.—MISCELLANEOUS AND ORNAMENTAL OBJECTS.

Juror.

Rt. Hon. Lord Ashburton, F.R.S., Deputy-Chairman of Jury on Furniture in the Exhibition of 1851.

Class XXVI.—PRINTING, PHOTOGRAPHY, &c.

Juror.

Charles Knight, Publisher.

Supplementary Juror.

Thomas De la Rue, Chairman of the Metropolitan Committee of Paper Makers and Stationers for the Paris Exhibition, and Juror in 1851.

Class XXVII.—MUSIC.

Juror.

Rt. Hon. Sir George Clerk, Bart., F.R.S., President of the Royal Academy of Music.

Class XXVIII.—PAINTING, ENGRAVING, and LITHOGRAPHY.

British Jurors for the Fine Arts.

Lord Elcho, M.P.
Daniel Maclise, Esq., R.A.
Frederick Tayler, Esq.
J. H. Robinson, Esq., Engraver.

Class XXIX.—SCULPTURE.

The Rt. Hon. Henry Labouchere, M.P.
R. Westmacott, Esq., R.A.
W. Calder Marshall, Esq., R.A.

Class XXX.—ARCHITECTURE.

Sir Charles Barry, R.A.
Professor Cockerell, R.A.

Mr. Cole on the General Management.

Appendix F.

Printed documents issued by the Board of Trade.

APPENDIX (F.)

Catalogue of Printed Documents used in the Operations of the British Commission in carrying on the Business of the Paris Exhibition.

No.	Date.	Nature of Document.
1	8 March 1853	Decrees, Regulations, and Instructions of the Imperial Commission.
2	28 May 1854	Summary of Conditions on which the Exhibition will be conducted.
3	„	Form of Demand for Space.
4	28 May 1854	Circular Letter accompanying Nos. 1, 2, and 3
4 *a*	„	„ „ „
5	8 March 1853	Decrees, Regulations, and Instructions of the Imperial Commission.
6	6 June 1854	Circular Letter summoning Committee (Precious Metals).
7	„	Circular Letter summoning Committee (Furniture and Decoration).
8	„	Circular Letter summoning Committee (Clocks and Watches).
9	„	Circular Letter summoning Committee (Silks).
10	26 June 1854	„ „ (Blank).
11	8 June 1854	Correspondence relating to the interests of British Manufacturers to exhibit in Paris in 1855.
12	20 June 1854	Resolutions of Committee (Musical Instruments).
13	„	Resolution passed by Council of Civil Engineers.
14	22 June 1854	Resolutions of Committee (Saddlery and Harness).
15	- -	Blank Form for summoning Committee.
16	- -	List of London Papers for Advertisements.
17	26 June 1854	Resolution of Committee (Philosophical Instruments).
18	1 July 1854	Resolution of Committee (Letterpress and Surface Printing, and Type-founding).
19	4 July 1854	Resolution of Committee (Hats and Caps).
20	12 July 1854	Circular Letter inviting Sculptors to exhibit.
21	„	Circular Letter announcing that a Secretary has been appointed to the Associate Committees of the Metropolis.
22	14 July 1854	Circular to Agricultural Implement Makers.
23	- -	Form of Demand for Space (Sculpture).
24	- -	Regulations as to Works of Sculpture.
25	- -	Directory.
26	19 July 1854	Report of meeting held at Manchester on the subject of the Exhibition, on the 13th July 1854.
27	20 July 1854	Resolution of Committee (Paper and Stationery).
28	22 July 1854	Circular Letter to Secretaries of Local Committee
29	- -	Form of Estimate of the Number of Exhibitors to accompany Circular to Local Committees (28).
30	25 July 1854	Circular Letters with respect to a due Representation of Agricultural Produce.
31	- -	Blank Circular accompanying No. 3.
32	- -	Regulations as to Paintings.
33	- -	Form of Demand for Space (Painting).
34	- -	Regulations as to Engraving and Lithography.

No.	Date.	Nature of Document.
35	- - -	Form of Demand for Space (Engraving and Lithography).
36	12 July 1854 -	Circular Letter to Painters inviting them to exhibit.
37	12 July 1854 -	Circular Letter to Engravers inviting them to exhibit.
38	29 July 1854 -	Circular Letter calling attention to Error in Article 13 of Decrees, and Paragraph 4 of Summary.
39	- - -	Circular stating Form of Demand for Space has been filled in from particulars given.
40	- - -	Form of Demand for Space after 1st August 1854.
41	- - -	Circular Letter to Architects, inviting them to exhibit.
42	4 Aug. 1854 -	Regulations as to Architecture.
43	- - -	Form of Demand for Space (Architecture).
44	- - -	Corrected Translation of Decrees, &c. of the Imperial Commission.
45	- - -	Letter to Artists respecting the examination of their Works.
46	6 Aug. 1854 -	Circular to Persons proposing to exhibit Machinery.
47	8 Aug. 1854 -	Circular Letter to Secretaries of Local Committees accompanying Directory (25).
48	- - -	Circular Letter accompanying No. 40.
49	- - -	Circular Letter on Agricultural Implements to be exhibited.
50	- - -	Circular to Applicants for Space after 1st August.
51	- - -	Extract from "London Gazette" of 15th September 1854.
52	5 Oct. 1854 -	Circular to Exhibitors distinct from any Local Committee.
53	5 Oct. 1854 -	Circular to Exhibitors having a Local Committee.
54	10 Oct. 1854 -	Memorandum with reference to Allotment of Space by Local Committees to accompany No. 53.
55	12 Oct. 1854 -	Circular to Agricultural Implement Makers.
56	- - -	Schedule to be filled up by makers of Agricultural Implements.
57	12 Oct. 1854 -	Circular to Exhibitors of Machinery.
58	Oct. 1854 -	„ „ of the Metropolis.
59	31 Oct. 1854 -	Circulars to Local Committees, enclosing Circular of Imperial Commission, No. 60.
60	Oct. 1854 -	Translation from the "Moniteur" of the 19th October 1854.
61	24 Oct. 1854 -	Circular to Metropolitan Exhibitors, A.
62	„ -	„ „ B.
63	„ -	Circular to Exhibitors distinct from any Committee, A.
64	„ -	Circular to Exhibitors distinct from any Committee, B.
65	Oct. 1854 -	Committee for Iron Trade.
66	Oct. 1854 -	Special Demand for Space (Iron Trade).
67	1 Nov. 1854 -	Summary of Conditions (No. 2) revised to this date.
68	- - -	List of Exhibitors to whom Space has been allotted by each Committee.
68 *a*	- - -	List of Exhibitors to whom Space has been allotted by Associate Metropolitan Committees.
69	- - -	List of Exhibitors to whom Space has been allotted by Associate Metropolitan Committees.
70	- - -	Circular to Exhibitors to whom Space has been allotted.
71	- - -	Form of Statement of Payments on account of Vote of £50,000.

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Printed documents issued by the Board of Trade.

No.	Date.	Nature of Document.
72	- - -	Fine Art Circular to Owners of Pictures, &c.
73	9 Dec. 1854 -	Allotment of Space Circular (Machinery).
74	15 Dec. 1854 -	Circular on Appropriation of the Offices in Paris.
75	13 Dec. 1854	Explanation of Plan of Space allotted to each Committee.
76	16 Dec. 1854 -	Instructions to Architects sending their Works to Gore House.
77	- - -	Ticket to be pasted on the back of the Frame of each Work sent by Architects.
78	Jan. 1855 -	Letter requesting Loan of Paintings.
78 *a*	„	Letter requesting Loan of Engravings.
79	„	Invitation from Chemical Committee of Royal Society to exhibit.
80	10 Jan. 1855 -	Allotment of Space (Agricultural Machinery).
81	Jan. 1855 -	List of Works of Art asked for.
82	Jan. 1855 -	Circular on Collection of Coals of the United Kingdom.
82 *a*	Jan. 1855 -	Form of Demand for Space (Coal Collection).
83	16 Jan. 1855 -	On the Superiority of Collective over Individual Exhibitions.
84	18 Jan. 1855 -	Notice to Exhibitors on Glass Cases, Fittings, &c.
84 *a*	Jan. 1855 -	Suggestive Modes of erecting Glass Cases and Fittings, for the consideration of Exhibitors.
85	18 Jan. 1855 -	Questions to Exhibitors on Fittings and Cases.
86	- - -	Acting Local Committees.
87	19 Jan. 1855 -	List of Proprietors of Works of Art made up to this date.
87 *a*	31 Jan. 1855 -	List of Proprietors of Works of Art made up to this date
88	- - -	Circular Letter stating Works of Art will be called for.
89	Jan. 1855 -	Circular Letter allotting Space (Fine Arts).
90	- - -	Form for apportioning the Exhibitors among the
	- - -	various classes.
91	- - -	Advice of Shipment.
92	- - -	Form for Travelling Expenses.
93	- - -	Fine Arts Form of Receipt Note.
94	- - -	Arrangements for Shipping Goods.
95	- - -	Shipment of Goods (accompanying No. 94).
96	- - -	Shipment of Goods by way of Dunkirk.
97	- - -	Special Shipment of Goods by way of ———
98	Jan. 1855 -	Circular Letter accompanying No. 99.
99	Jan. 1855 -	Circular Letter stating assent or dissent from joining in Expense of Glass Case.
100	- - -	Circular Letter accompanying Papers for Despatch of Fine Arts.
101	- - -	Circular Letter announcing Despatch of Fine Arts.
102	- - -	Address Card (Fine Arts).
103	- - -	Circular Letter acknowledging Arrival of Works of Art.
104	- - -	Contractors in Paris for Glass Cases, &c.
105	1 Feb. 1855 -	Circular Letter stating Rotation Number of Exhibitor.
106	Feb. 1855 -	Instructions as to Safe Transmission of Works of Art.
107	1 Feb. 1855 -	Notice on the Employment of Agents in Paris. Contracts for Cases, &c.
108	- - -	List for the Information of the French Customs (Bulletin d'Expédition).

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Printed documents issued by the Board of Trade.

No.	Date.	Nature of Document.
109	5 Feb. 1855 -	Notice of Insurance of Works of Art sent to the Paris Exhibition.
110	13 Feb. 1855 -	Notice on Addressing the Packages.
111	- - -	Circular of Introduction.
112	March 1855 -	Notice of Insurance of Works of Art sent to the Paris Exhibition.
113	20 Feb. 1855 -	Circular Letter on filling up of the Exhibitor's Bulletin.
114	16 Feb. 1855 -	Request for the immediate Return of Circulars on Shipment.
115	- - -	Rules for Receiving and Delivering Works of Art.
116	- - -	Circular Letter to Owners of Cattle Pictures.
117	- - -	Form of Demand for Space for Cattle Pictures.
118	- - -	List of Pictures in Oil.
119	- - -	„ Water Colours.
120	22 Feb. 1855 -	Circular Letter on Time for despatching Goods to Paris.
121	- - -	Circular Letter stating last Day for receiving Specimens of Coal.
122	- - -	Circular Letter stating Works of Architecture have been passed.
122 *a*	- - -	Circular accompanying No. 122.
123	1 March 1855	Circular Letter stating Mr. Cole has been appointed to Superintend the Arrangements of the British Section of the Exhibition.
124	15 March 1855	Circular Letter on Price Lists and Trade Circulars.
125	- -	Report on the preliminary Measures adopted.
126	16 March 1855	Notice, enclosing Circular, with Information required for Catalogue by Imperial Commission.
127	23 March 1855	Notice on Correspondence.
128	29 March 1855	Notice on the Despatch of Goods.
129	31 March 1855	Notice on Postage of Letters.
130	- - -	Special Instructions for the Guidance of the International Jury.
131	- - -	Circular stating all Correspondence to be addressed to Paris.
132	- - -	Notice on Passports to Workmen visiting the Paris Exhibition.
133	28 May 1855 -	Circular Letter on Rewards to Workmen.
134	- - -	Agency and Distribution of Prospectuses, &c.
134 *a*	- - -	Form for Names of Workmen.
135	25 June 1855 -	Notice to Exhibitors on Meeting of the Juries.
136	2 July 1855 -	Resolution of a Meeting of the British Jurors held this day.
136 *a*	14 June 1855 -	Appointment of British Jurors.
137	16 July 1855 -	Circular Letter accompanying No. 136.
138	27 July 1855 -	Circular Letter on inserting Woodcuts of Objects exhibited and Statement of Prices, &c. in Catalogue.
139	17 Oct. 1855 -	Notice announcing Closing of Exhibition to take place on the 15th November.
140	30 Nov. 1855 -	Notice to Exhibitors to whom Prizes have been awarded.
141	- - -	List of Awards.

G. F. Duncombe.

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Appendix F.

Extracts from printed documents.

EXTRACTS from PRINTED DOCUMENTS issued by the BOARD OF TRADE.

The following extracts from some of the circulars, which were from time to time, as the occasion required, transmitted to exhibitors, may be found useful as embodying a few important principles, which were followed in the management of the British section of the Exhibition.

As soon as a house had been hired in Paris for offices, exhibitors were informed that—

Appropriation of the offices in Paris. No. 74, 15th December 1854.

"It is the wish of my Lords to make this house as extensively useful as possible to the committees who have been co-operating with them in securing a creditable representation of the industry and of the Fine Arts of the United Kingdom, as well as to the officers who may be sent to Paris by my Lords to yield the necessary assistance, information, and support to the exhibitors."

"My Lords consider that it is very desirable not only that the French people should see the British goods displayed in the Exhibition, but that facilities should be given for obtaining all the information possible with respect to price, rate of production, the facility with which orders can be executed, &c.; and it is considered that an office in a central situation, adjoining the Exhibition, where such information could be obtained with readiness, would be of great service to the French public, and to the exhibitors of the United Kingdom and its dependencies."

"The accommodation will not be sufficient to allow of the same facilities being offered to the agents of individual exhibitors; but it is proposed to provide means by which during the arrangements, and during the Exhibition itself, exhibitors may, should they think proper, have their letters sent to the same address."

Superiority of collective over individual exhibitions. No. 83, 16th Jan. 1855.

The superiority of a collective over an individual display of the manufactures belonging to one class having been appreciated by the Board of Trade, the adoption of the plan suggested by the Secretary of the Imperial Commission was urged upon the exhibitors in the following circular:—

"I. Many important seats of manufacture, like Manchester, Sheffield, and Glasgow, and branches of trade, like the silk trade of Spitalfields, the printing, boot and shoe, and saddlers' trades of the metropolis, have already combined to exhibit collections complete and illustrating the details of each trade in all its branches, to be arranged in *groups* in stalls, or in one or more glass cases, according to circumstances. This mode of action has been adopted in order that the local display should not be left to accident to be made by individuals on their own judgment alone, but with the judgment of all who are interested in the complete representation of the industry of the locality; and as these arrangements conduce in a high degree to rendering the necessarily limited amount of space all the more effective for the object of an exhibition of national industry, it has been judged desirable to explain in some detail to those local committees, who may not have adopted already the collective principle of exhibition, the means by which such mode adapts itself to the limited amount of space, and, at the same time, promotes the interests of individual exhibitors and the perfect display of British industry.

"II. The great object on the present occasion is to convey to the French public and the visitors to the Exhibition, likely to come from all parts of the world, a complete and general impression of the industry and resources of each of our great seats of manufacture. M. Dufour, the Secretary of the Imperial Commission, has pointed out how this may be easily done without destroying the individuality of each exhibitor. For instance, a stall may be headed as the "Lock Trade of Wolverhampton," or the "Silk Trade of Spitalfields," represented by the following houses (here to follow the names in alphabetical order):

A. B.
C. D.
E. F., &c.

And instead of showing a specimen of every description of goods which every firm was able to produce, a complete collection may be formed of all the different kinds of locks and silks made in those localities, from the cheapest to the dearest,

correctly classified and arranged, each house being called upon to supply specimens of those particular goods in which it has the largest trade or the greatest celebrity. Each specimen might, or might not, bear, on a small card, the name of the actual manufacturer, but on the stall and in the catalogue each firm would not only appear as the contributor of the few specimens shown, but as one of the manufacturers representing that particular industry of their locality, and able to supply orders for all kinds.

"III. Doubtless there are other principles upon which such a collective exhibition might be formed, and the same objects attained by different means; but it is evident that the general impression of such arrangements would be infinitely superior to a number of little cases occupied each by a distinct exhibitor. Not only will it be more useful to the country and to the locality, but to the individual exhibitors themselves.

Glass cases. No. 98, 31st Jan. 1855.

In furtherance of the above plan, the Associate Committees of the metropolis requested the issue of a special circular on the subject:—

"The Associate Committee for the representation of the above branch of industry are of opinion that it would be greatly to the advantage of the exhibitors, if they united in the expense of a glass case, wherein to exhibit their goods; inasmuch as it would be a great saving of expense, and ensure a judicious display: the individuality of each exhibitor being still preserved."

Rotation number. No. 105, 1st Feb. 1855.

A number was given to every exhibitor, in order to facilitate his identification, and was found of great service in the transport arrangements, &c.; the following is the special use he was requested to make of this designation:—

"I am directed to acquaint you that your rotation number for the Paris Exhibition is ———, and I have to request that in order to prevent error in all future correspondence, you will have the kindness to put this number at the top of the first page of all letters or documents (in the same manner as it is inserted above), and that you will be *particularly careful* that it is attached to *every* package you may forward."

Employment of agents in Paris. No. 107, 1st Feb. 1855.

It was thought that time and trouble would be saved, if information respecting persons willing to undertake agencies and contracts for glass cases, &c., were communicated to exhibitors, leaving them to make their election between their own friends, and the persons who were accredited by the Imperial Commission. The names of agents communicated to this Department by the French authorities were therefore sent to exhibitors, who were, however, told that—

"The responsibility of employing agents in Paris rests wholly on exhibitors; and in affording any information on the subject of agency, the Department of Science and Art leaves the question of using it or not entirely to the discretion of the exhibitors.

"Exhibitors are able to make their own inquiries respecting agents in this country, and require no information from the Department; but it may perhaps be convenient to them to learn the names of those parties in France offering themselves as agents, which have been communicated by the Imperial Commission. In *all cases*, when exhibitors think fit to employ persons in Paris as agents or tradesmen, their communications must be sent direct to those parties, and *not to this Department.*

"Exhibitors should be cautioned against employing persons not accredited by the Imperial Commission."

Agency, distribution of prospectuses, &c. No. 134, 19th June 1855.

Complaints having been frequently made during the Exhibition, that answers to inquiries respecting the prices, &c., of the British productions could not be obtained, in consequence of the neglect of exhibitors to provide means of affording this information, and of their having simply placed their goods in the building and then left them, it was thought advisable urgently to recommend,—

"That exhibitors should either attend themselves, or appoint a proper representative of their own to attend for them in the building, and that when this may not be possible, they should make arrangements so that some suitable person, if not stationary at their own spaces, may at least be always found in the building, and able to give information, lists of prices, &c."

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"It is recommended that every exhibitor should cause a proper supply of cards of address, prices current, prospectuses, &c. to be provided, in order that they may be taken away by inquirers. The French Government has remitted the usual stamp attached to these documents, in order to promote the circulation of commercial information. These prospectuses, &c. should be translated into French and German. Copies should always be found at every exhibitor's space."

"The exhibition is not intended to be a mere show, entailing unprofitable trouble on the exhibitors, and creating wishes among visitors which cannot be gratified. The President of the Imperial Commission, the Prince Napoleon, stated in his address that the term 'prohibition' had been abolished in the Exhibition, and it is the duty of exhibitors, as well as their interest, to spare no exertions to make the Exhibition as useful as possible."

G. F. Duncombe.

Appendix G.

APPENDIX (G.)

Statement of the Operation of the Law which guaranteed from Piracy the Designs and Inventions exhibited, as far as concerned British Exhibitors.

Law for the protection of designs and inventions.

The law, passed in the early part of May 1855, enabled exhibitors of inventions and designs to obtain gratuitously from the Imperial Commission a certificate, containing a description of the object exhibited. This certificate, which was only granted after the object had been ascertained to be actually in the Exhibition building, guaranteed to the exhibitor the same rights as a patent of invention up to the 1st of May 1856. The number of certificates applied for by exhibitors from the United Kingdom, under the rules laid down by this law, was as follows :—

Table showing the Number of Applications for Certificates by British Exhibitors.

Class.	No. in Catalogue.	Name of Exhibitor.	Object.
IV.	133	Walker, Thos.	Rotary steam engine.
V.	200	Davies and Sons	Improved brougham, and new wheel.
„	227	Miles, Ezra	System for coupling pipes and tubes.
„	209	Rock and Son	"Carriage diaropha," new railway truck, new tent.
VI.	292	Donkin, Bryan	Rag and rope cutting machine.
VII.	334*a*	Crossley, John	Designs for carpets.
VIII.	406	Smyth, C. Piazzi	Improvements in astronomical instruments.
X.	584	Hodges, R. E.	Improved doors.
XII.	726	Gray, J.	Flushing apparatus.
„	766	Little, R. J., Major, R.M.	Cocks for fire engines, &c.
XIII.	839	Harris, Richard	Improved sponge for cannon.
XVII.	1,164	Bisson, Hyacinthe	Jewellery.
XIX.	1,256	Clarke, J. F.	Improved bobbins.
XX.	1,384	Clabburn, Sons, and Crisp.	New shawl.
XXV.	1,755	Atloff, J. G.	New shoes and cheap boot.
„	1,759	Coles, W. F.	Cork linings for boots and shoes.
„	1,769	Hall, Sparkes	New kind of clog.
„	1,740	Smith, Charlotte	Corset and fastener.
„	1,750	Wansbrough, J.	India rubber garments.
XXVI.	1,897	Aresti, J.	New process in lithography.

G. F. Duncombe.

APPENDIX (H.)

RETURN showing the NUMBER of LETTERS received and despatched by the BRITISH COMMISSION from 30th of April 1853 to the end of January 1856.

Year.	Month.	Number of Letters registered as received, exclusive of Forms returned for Catalogue, Jury, Customs, &c.		Number of Letters despatched not including Circulars.		
		Number each Month.	Total.	From London.	From Paris.	Total.
1853	May	3		Circulars to manufacturers inviting them to exhibit.		
„	June	16				
„	July	62				
„	August	51				
„	September	25				
„	October	6				
„	November	5				
„	December	5				
			173			
1854	January	2		Circulars, &c. issued.		
„	February	6				
„	March	2				
„	April	6				
„	May	42				
„	June	445				
„	July	929		2,562		
„	August	1,298		884		
„	September	189		540		
„	October	361		456		
„	November	290		275		
„	December	328		744		
			3,898			
				5,461	—	5,461
1855	January	960		1,756		
„	February	1,806		4,760		
„	March	2,225		2,265		
„	April	987		112	128	
„	May	626		21	247	
„	June	459		12	248	
„	July	532		2	312	
„	August	356		—	216	
„	September	285		—	175	
„	October	240		—	228	
„	November	1,058		—	349	
„	December	667		128	94	
			10,201			
				9,056	1,997	11,053
1856	January	710				
			710	159	—	159
			14,982			16,673

G. F. DUNCOMBE.

APPENDIX (I.)

Mr. Cole on the General Management.

Appendix I.

Regulations of the Royal Agricultural Society respecting juries.

Juries at the Shows of the Royal Agricultural Society of England.

Selection.

The Judges for each department are selected by the Council, or a committee appointed by the Council for that purpose.

They are partly professional engineers and partly practical agriculturists, well acquainted with machinery; with the Consulting Engineer of the society as general referee. It is not allowed to be publicly known who are selected as Judges.

Appointment.

An official letter is sent to each Judge, informing him of,—

1st. His appointment.

2nd. The day and hour, and place of assembling.

3rd. The payment of expenses, &c. allowed by the Society,—is for expenses and one day's attendance, 8*l.*, and 2*l.* additional for every day after the first.

Number of Judges.

The Judges usually work in pairs, the Consulting Engineer or another Judge being called in when requisite.

In the case of very important prizes, and one where the adjudication is unusually difficult, such as the 500*l.* prize for steam ploughs, several Judges are associated for such particular purpose.

Modus Operandi.

The names of the Judges are called over punctually at the hour specified for assembling.

Their attention is called to the printed instructions for the guidance of the Judges, and to the conditions of the various prizes; and catalogues are placed in their hands, together with printed tabular forms for the registration of results obtained by dynamometers, and quality of work done, time, speed of motive power, &c.

A Steward has charge of one or more sets of Judges, and sees that they have any assistance, such as stores, men, &c. they may require.

Cases of Difficulty.

If any difficulty should arise as to interpretation of the rules, qualification to compete, &c., which the Steward in charge cannot decide, the Director of the Show is informed, and the whole of the Stewards are assembled to decide the case.

Time.

The time occupied is usually four days. The Judges commence never later than nine o'clock in the morning, and *do not leave their work all day*, refreshments, &c. being provided at the Society's expense.

Award.—(*Time of Delivery.*)

The Judges have to write out and sign their award of prizes, &c. on printed forms prepared for the purpose, and deliver them to the Director of the Show before they leave the yard in the evening of the last day (the fourth) set apart for their operations.

(*Publicity.*)

The Award of the Judges is affixed to every prize implement before the public are admitted the next morning.

Reports.

In addition to the actual award of prizes, &c., the Judges have to make detail reports on the machinery that has come under their notice.

(*Date of Delivery.*)

These reports have to be delivered in by the 1st August (the Show itself being held in July).

(*Publicity.*)

These reports are printed in the next number of the Journal of the Society, together with the tabular statement of the results obtained in each trial.

B. T. Brandreth Gibbs.

Report on the Arrangements for Contributing a Collection of Works of Fine Art to the Paris Universal Exhibition.—By Richard Redgrave, R.A.

Mr. Redgrave on the Fine Arts Arrangements.

To the Right Hon. the Lord Stanley of Alderley, President of the Lords of the Committee of Privy Council for Trade, &c., &c., &c.

Marlborough House, London,
12th February 1855.

My Lord,

Having been charged by the Board of Trade with the necessary arrangements for contributing a collection of works of painting, sculpture, architecture, and engraving to the Paris Universal Exhibition, I have the honor to report the steps taken for that purpose.

Invitation from French Government to send Works of Art.

By the Imperial decree constituting the Paris Universal Exhibition, it was determined that one section of the Exhibition should consist of works of Fine Art in painting, engraving, sculpture, and architecture, and the assistance of Her Majesty's Government was requested in furtherance of this object.

It was evident, however, that there was little inducement to our artists to exhibit their works on the continent, and that in order to contribute a collection worthy of the Arts of the United Kingdom, all the arrangements must be made and the expense borne by the British Government.

Works to be by artists living at the date of the Decree.

This was the more necessary because the Imperial Decree had wisely determined, in the best interests of Art, that the works contributed, while they were to be by living artists, were not to be restricted to those recently executed, or as yet unexhibited, but might consist of those executed at any period of the artist's life. Thus many of the best works the various artists would desire to contribute were no longer in their own possession, but had to be sought for from their proprietors, who, it was to be presumed, would more willingly confide them to the Government for a national purpose than spare them at the request of individuals. At the desire of the Board, therefore, an estimate of the cost of these arrangements, founded on the best information that could be obtained, was prepared, and received their approval.

Amount of space required.

The next step was to reply to the inquiry of the Imperial Commission, as to what amount of exhibiting space would

MR. REDGRAVE ON THE FINE ARTS ARRANGEMENTS.

be required for works of British Art in painting, sculpture, architecture, and engraving.

No specific data existed for this purpose. A careful measurement was, therefore, made of the length of line opposite the eye, and the superficial wall space in the principal metropolitan exhibitions, both of oil and water-colour painting and architecture. The average number of pictures which, during several years, that space had contained, the average number of artists exhibiting, and the average number of works by each, afforded a means of calculation on which the request for the requisite amount of space for such works was founded. With regard to engravings, the only means of arriving at any conclusion was by computing the average size of engravings, and the probable number of exhibitors, and allowing a certain number of works for each. The list of sculptors contributing works to the Great Exhibition of 1851 afforded sufficient means for determining the probable space required for these works.

From all these sources the requisite exhibiting space was calculated to be as under:—

For paintings in oil . .	7,000 square feet.
For paintings in water-colours	1,500 „
For engravings . . .	2,100 „
For architectural drawings .	1,400 „

being a total of 12,000 square feet of wall space, besides 1,100 square feet of floor space, for architectural models and for works in sculpture.

Request for space to this amount was made to the Imperial Commission, it being added that British pictures in oil could not be hung with the tops of the frames above 15 ft. from the ground, nor the other works above 9 ft. 6 in. from the ground. The space, under these conditions, was accordingly promised.

Appointment of committees to advise the Board of Trade.

Having determined the probable amount of space requisite for the suitable representation of our national Art, the next step was to organize committees of artists who should advise the Board of Trade, in the preparation of lists of those works of which the collection should be composed. It was desirable that these committees should be so liberally constituted as to consist of the most eminent artists in the various classes of Art, and include those connected with each of the great societies. The following gentlemen were requested to act, with the Commissioner for Fine Arts, for that purpose:—

Sir C. Eastlake, President of the Royal Academy of London.

Sir John Watson Gordon, President of the Royal Academy of Edinburgh.

M. Cregan, Esq., President of the Royal Hibernian Academy.

F. Y. Hurlstone, Esq., President of the Society of British Artists.

R. S. Lauder, Esq., R.S.A., President of the National Institute of British Artists.

Copley Fielding, Esq., President of the Old Society of Painters in Water Colours.

Henry Warren, Esq., President of the New Society of Painters in Water Colours.

Of these gentlemen three were prevented attending in London, and, although two assisted with written suggestions, the committee finally consisted of Sir. C. Eastlake, F. Y. Hurlstone, Copley Fielding, and H. Warren, Esqrs.

The committee for engraving and lithography consisted of J. H. Robinson, Esq., R. J. Lane, Esq., A.E.R.A., and R. Wornum, Esq., Librarian to the Department of Science and Art.

For sculpture, Sir Richard Westmacott, Professor of Sculpture in the Royal Academy, Calder Marshall, Esq., R.A., a member of the Royal Scottish Academy, and John Bell, Esq., charged in 1851 with the arrangement of the sculpture in the Great Exhibition, consented to act on the committee.

For architecture, Professor Cockerell, R.A., Professor Donaldson, President of the Institute of British Architects, and G. G. Scott, Esq., Treasurer of the Architectural Exhibition, formed the committee to invite exhibitors, and prepare a list of their works.

Principles adopted for securing a worthy representation of Fine Arts.

As it had been determined to send a collection of works of Art at the national expense, and one worthily representing the Arts of the country, the number of artists and as well as the number of works they should exhibit was necessarily limited, and a degree of selection indispensable. The principle adopted for this purpose by all the committees was similar, viz., to make the invitation to artists as general as was possible consistently with the honourable representation of British Art, and to provide that each artist invited to contribute should, in the first instance, as far as possible, *himself* decide on those works which he would wish to exhibit.

For this purpose, when the persons to be invited had been determined, each was requested to name, in the order in which he appreciated them, a number of his works, together with the size and value, and the present proprietor of each;

Mr. Redgrave on the Fine Arts Arrangements.

and to insert in the list more than it was presumed could be exhibited. By these means the committee were not only able to allot a proportionate space to each artist, but to endeavour that each should be as fully represented as possible.

This information being obtained, the Board of Trade requested from the various proprietors the loan of the works for exhibition, undertaking carefully to pack them, to insure their value from accidents of transit and from fire, and to return them to the proprietors free of expense.

When the request was unsuccessful for the first works named on the artist's list, immediate application was made for those next in succession.

Applications for the loan of works of Art to the various proprietors were generally most liberally acceded to; but there is reason to regret that in a few instances fine works were found to be unattainable, and artists were disappointed of pictures or statues which would have done them honor in the Exhibition. On the whole, however, the collection was a most satisfactory one, and universally acknowledged as highly honorable to British Art.

Many works were excluded by the terms of the Decree.

It is to be regretted, nevertheless, that by the terms of the Imperial Decree, the works of so many eminent artists of the British school, lately deceased, could not be exhibited, and the collection therefore included no pictures by either Turner, Callcott, Constable, Collins, Dewint, Etty, Hilton, or Wilkie.

While in every case care was taken to include in the invitations of the Committee all artists of known reputation, in order to provide that none should be overlooked, notices in the public prints invited, for the consideration of the Committees, applications from all those who were desirous of exhibiting.

Replies to the invitations to exhibit.

The invitations of the Committees were variously responded to, some few artists of high talent declining to contribute, however, lists were obtained from—

112	Painters in oil, naming . .	377	works.
64	Painters in water colours .	190	„
67	Engravers, wood engravers, and lithographers . .	203	„
68	Architects	196	„
38	Sculptors	106	„
In all 349	artists named . . .	1,072	„

Finally, there were obtained from the various proprietors for the purpose of being exhibited at Paris— MR. REDGRAVE ON THE FINE ARTS ARRANGEMENTS.

234 works in oil, by	99	artists,	valued at	96,130*l.*
145 „ in water colours, by	52	„	„	15,653*l.*
197 engravings & lithographs, by	62	„	„	1,676*l.*
127 architectural works, by	51	„	„	5,765*l.*
51 statues and 24 busts and bas-reliefs, by	35	„	„	*18,336*l.*

Works actually exhibited and insured.

being a total of 778 works of art, by 299 artists, at a total value of 137,560*l.*, for which sum an insurance was effected with the underwriters at Lloyd's and others, against all accidents by rail and sea, both going and returning; and also against damage by fire while in the building, and during transit.

The artists who were to contribute being invited, their works selected, and the loan of them for exhibition obtained from the various proprietors, an arrangement was entered into with Mr. J. Green, who has had great experience in like duties, to pack them for transmission to Paris.

Arrangements for transmission to Paris.

To secure the careful, judicious, and impartial hanging and placing of the various works, the Board requested three artists to advise with the Art Superintendent for the paintings, engravings, and architecture, and one for the works of sculpture.

For hanging and placing the works.

The gentlemen so named were T. Creswick, Esq., R.A., F. Y. Hurlstone, Esq., and Copley Fielding, Esq.; but the latter gentleman being obliged to decline on account of failing health, Mr. H. Warren was named instead.

John Bell, Esq., was requested to aid in the arrangement of the works in sculpture.

Previous to sending the works to Paris, a survey of the buildings appropriated to receive the Fine Arts was made by the Secretary to the Commission, Captain Fowke, R.E., and as it appeared that the means of averting danger from fire were very insufficient, and that a sugar refinery was in most dangerous proximity to the Palais, the Board ordered an examination to be made by the surveyor to the London insurance companies. On receiving his report and suggestions, requisition was made to the French Government for an increased supply of water, that it should be laid on outside the building for the Fine Arts, as well as inside, and

Survey of the building in Paris.

* This would show an average value of about 411*l.* for each of the works in oil; of about 108*l.* for each of those in water-colours; and of about 244*l.* for each work in sculpture; for obvious reasons a calculation of this kind would be useless as regards architectural works and engravings.

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that the cases and waste packages should be removed from the vaults beneath. This the French Government most readily undertook to do, and also, in order to skreen the danger from the sugar refinery, to build on the narrow strip of ground between it and the Palais a wall of great length, 40 feet high, towering above both buildings. During the time the pictures were being packed in London, Mr. Braidwood, of the Fire Brigade, was requested to give the building containing them continuous supervision, as also the wharf whence they were to be shipped, to assure their safety as far as was possible.

Nature of the galleries allotted to British Works of Art.

When the arranging Committee arrived in Paris, and examined the galleries intended for the works from the United Kingdom, it was found, that although small in comparison with the vast and lofty salons appropriated to French and German Art, they were not unsuitable to British pictures, consisting as these do mainly of works whose average size is small, and their character of careful execution such as to render it impossible to hang them so far above the eye as was necessary in the larger halls.

The line space at first offered to the Committee was much shorter than had been promised, and would have required the works to be hung much higher than was proposed; this was strongly objected to, and although more space was gradually accorded, it was found desirable to lower the line of hanging in the British space, so as to bring two lines of pictures to the eye, instead of one as in the French hanging. Thus the base line (above which the pictures were to be arranged) was lowered from three feet, the French line, to two feet six inches, adopted in the English space. Below this nothing was placed, and by arranging works of small size first, an excellent upper line was obtained for kit-cat and half length works.

Reports on arrangement.

The other difficulties of arrangement and the steps taken to overcome them, as well as to arrange the sculpture to the best advantage, are fully detailed in two reports which will be found appended (see Appendix A and B).

Particulars as to the size of galleries and mode of lighting, &c.

It may be well to record here a few particulars as to the size and mode of lighting these galleries, and the height of the pictures from the floor, since it is not contained in the above reports, and may be found useful as a reference in such matters.

Oil paintings.

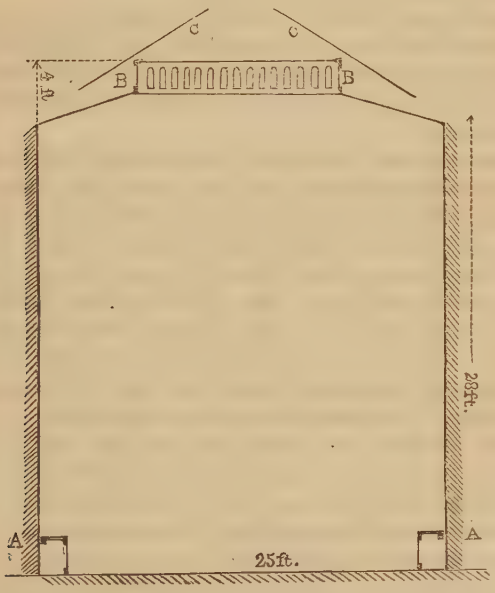
The gallery appropriated to British pictures in oil was on the north side of the "Palais des Beaux Arts" running the whole length of the building. It was 440 feet long, 25 feet wide, and 28 feet high. Of this gallery, about 300

MR. REDGRAVE ON THE FINE ARTS ARRANGEMENTS.

feet in length was, on two sides, occupied by British pictures in oil. It must be remembered, however, that the walls were broken by twelve openings of large size, thereby reducing the actual wall space for hanging to a length of 420 feet.

The numerous short spaces occasioned by these openings, rendered still shorter by their being subdivided by large projecting water pipes conducting the waste water from the roof of the building, made the task of arrangement very difficult, preventing the usual proceeding of hanging the works from centres, and was only to be overcome by great care, labour, and consideration.

This long gallery was lighted throughout the whole length by a flat sky-light, occupying about half the width



of the ceiling, as shown in the section. The line A A, as lowered by the Committee of Arrangement, was 2 ft. 6 in. from the floor, leaving a space of about 24 ft. above it for arranging the works. The upright space B B, under sky-light, was pierced the whole length for ventilation; and the flat sky-light itself covered with a sloping glass roof C C.

Mode of arranging the pictures.

It was first required of the Arranging Committee to hang the British pictures to the top of the space; but this was wholly objected to on our parts, since, besides the other considerations before spoken of, the narrowness of the gal-

Mr. Redgrave on the Fine Arts Arrangements.

lery prevented works, however large, from being seen at that height from the floor. As it was, when the pictures were finally hung, the average height of the *tops* of the frames of the highest pictures was 5 French metres from the floor, or about 16 ft. 6 in.; a few of the very large pictures being about 3 ft. higher. In the larger and far higher salons of France and Germany, the works, when hung, averaged 10 metres, or about 33 ft. to the top of the frame, and many of the larger works 11 metres,—while the *bottoms* of the frames of many pictures were 5 metres above the floor.

Space occupied by the Works of Art in oil.

The lighting of this gallery was excellent, and it required very little slope in the pictures to accommodate the angle of incidence of the rays of light to the picture and to the spectator. The gallery, however, would have been much improved by being 5 or 6 ft. wider.

Water-colour paintings, engravings, &c.

Taking the above lengths and the average height above the line at 15 ft., the space occupied by British pictures in oil would be about 6,300 square feet, or rather less than an average of 27 square feet to each picture, and 63½ square feet to each artist.

The water-colour paintings, engravings, enamels, and architectural designs were hung in an upper gallery, which ran all round the principal building. This gallery was 21 ft. in width, and about 19 ft. in height, and lighted, as the oil-colour gallery, with a flat sky-light, occupying about hal the centre of the ceiling. The lighting was excellent, and the only defect arose from the glazing of the works acting as so many mirrors, and reflecting the opposite side of the gallery, thereby interfering with the view of the spectator.

Space occupied.

Two hundred and twenty feet on each side in the north gallery were taken up by British works. Of these four hundred and forty feet, one hundred and thirty feet in length were occupied by paintings in water-colours; and one hundred and thirty feet, opposite the water-colour paintings, by engravings; while, for the rest of the length, ninety feet on each side were hung with architectural designs.

A much shorter space was originally marked off for British works. Here, as in the gallery below, it had been urged on us to hang the works up to the ceiling; but strong objections being made on the part of the Hanging Committee, greater length was afforded, although not equal to the original demand. Here also the line was lowered to 2 ft. 6 in., which formed the base of the lowest works, and, when all were finally arranged, the tops of the frames of the water-colour paintings (with the exception of five or six works) ranged under eleven feet six inches. Taking

the average height at nine feet six inches the water-colour drawings would occupy a space of about 1240 square feet, being about 8 ft. 6 in., on an average, to each picture, and 24 square feet to each artist.

Taking the same average height for the engravings and for architecture, it would allow, in the first case, a total of 1,240 ft., being about 6½ ft. as the average of each work, and 20 ft. as the average space to each artist; whilst in architecture it would give a total of 1,710 feet, being about 13 ft. 6 in. to each work, and about 33 square feet to each architect exhibiting, independently of the seven architectural models which were ranged down the middle of the gallery.

Name of artist and subject of work attached to each picture and statue.

Adopting a suggestion of Her Majesty when visiting the Vernon collection of pictures, the name of each artist and the subject of his picture or statue, both in French and English, was attached legibly to the picture or statue, as well as inserted in the catalogue. This was highly appreciated by the public, and increased the attraction of the British collection of works from the ready information it afforded.

Sculpture.

The space assigned by the French Imperial Commission to the works of sculpture from the United Kingdom was a long gallery running parallel to that appropriated to our oil paintings, and communicating with it at each end. The dimensions of this hall were as follows: width, 21 ft. 6 in.; height, 20 ft.; length, 96 ft. It was lighted on the north side, throughout its whole length, by windows 11 ft. 9 in. from the ground, and 6 ft. 8 in. high.

Arrangement of the works.

As an exhibition room for sculpture it could hardly be considered satisfactory, either in respect of lighting, proportion, or means of access; nevertheless, after the fullest consideration, it was accepted, as leaving Mr. Bell more at liberty to choose his own mode of arrangement, as to the position, light and shade, height, and background of the various works. It was, however, not nearly spacious enough for the purpose, even with the six places for large statues afforded by the intercolumnations in the picture gallery. After many applications, the Imperial Commission at length assented to statues being placed down the centre of our picture gallery, where they were most judiciously disposed by Mr. Bell, who thus found places for thirteen statues. When arranged, the general effect was so satisfactory that it led to a like treatment being adopted for foreign statues in the corresponding galleries of the building.

Ready for opening on 1st May.

The whole of the works of Fine Art were properly arranged and everything ready for opening on the 1st of May,

MR. REDGRAVE ON THE FINE ARTS ARRANGEMENTS.

according to the original intention of the Imperial Committee; but as the industrial section of the Exhibition was not in a proper state of forwardness, the opening was necessarily deferred to the 15th of May.

Jurors named by the Government.

By the terms of the Imperial Decree, various prizes and medals were to be awarded to the works of Fine Art by international juries, composed of Frenchmen and foreigners, in proportion to the number of exhibitors in each class. In conformity with this Decree, the Board of Trade were requested by the Imperial Commission to nominate four British jurors for painting and engraving, three for sculpture, and two for architecture.

The experience as to medals and awards derived from the Great Exhibition of 1851, rendered it a subject of much consideration whether it would not be desirable to decline naming jurors for Great Britain, and to leave the entire decision of these rewards to the French themselves; but finally it was thought better to comply with the wishes of the Imperial Commission, and the following noblemen and gentlemen having been requested to undertake this honourable duty, kindly acceded to the wishes of the Board:

For painting and engraving,—

Lord Elcho, M.P.
Daniel Maclise, Esq., R.A.
J. H. Robinson, Esq.
F. Tayler, Esq.

For sculpture,—

The Right Honorable H. Labouchere, M.P.
W. Calder Marshall, Esq., R.A.
R. Westmacott, Esq., R.A.

For architecture,—

Sir Charles Barry, R.A.
Professor Cockerell, R.A.

After various delays and postponements, the mixed juries made their final report, including the following medals and awards, for the United Kingdom, for the three classes of Fine Arts,—

2 Great Medals of Honour,
10 1st Class Medals,
12 2d ditto ditto,
7 3d ditto ditto,
34 Honorable Mentions;

being 65 awards among 299 artists, or about 1 to every 4½.

These awards, made in juries wherein French jurors largely preponderated, must of necessity be considered rather French than international. From the first it was apparent that they could hardly prove satisfactory to British artists; and, while every acknowledgment is most justly due to those jurors who devoted their time and labour to a delicate and critical office, there is no doubt that the result only cumulates the experience of 1851, and proves the fallacy and insufficiency of this mode of deciding on the comparative merits of those exhibiting.

Mr. Redgrave on the Fine Arts Arrangements.

Their fallacy.

It only remained, on the close of the Exhibition, to take every precaution for the safe package and return of the works. The workmen who had collected and packed them were sent over by Mr. Green; and the whole of the pictures and statues were carefully repacked by them, under my superintendence, for re-shipment by way of Dunkerque, and re-distribution in England.

Return of the Works of Art.

In this report, which is intended solely to relate the steps taken to form a collection of British Art in Paris, to ensure its proper display and safe transit, it would be out of place to enter upon any comparison between British Art and the Art of other countries. It may, however, be allowed to speak of the great value of the Fine Art Section of the Universal Exhibition, as affording a means of making the various contributing nations acquainted with their relative progress and standing in Art, and of doing away with many traditional errors and national prejudices. Herein it was seen that Art was not limited to any clime or country; countries far north sending works of genius which were wanting from Italy, the land of their birth-place. In this collective exhibition, the student of Art could see and weigh the relative merits and defects of the modern schools in invention, imagination, form, colour, and execution; and each learning of each, it may be hoped that greater general excellence will be the result. Nor will its effects be lost on the *industries* of the various lands, since there can be little doubt that the industrial arts in any country progress with the advance in Fine Art, and decline with its decline; and that the nation that would add taste to skill in its manufactures can little hope to do so unless by a general and generous cultivation of the Arts.

General considerations.

It is satisfactory to be able to report that the work has been completed without any extensive damage or loss. Such breakage as has occurred has been chiefly confined to works of sculpture in marble and plaster, and the large glasses of water-colour and architectural drawings. This, although

Damage done to the works.

Mr. Redgrave on the Fine Arts Arrangements.

much to be lamented, has arisen notwithstanding every possible care and precaution on our part.*

Risks to which they are exposed.

It is impossible, however, not to have seen, in the course of these duties, the great risk of injury to which invaluable works of Art,—works which no money can replace,—are exposed by these distant voyages; risk not only arising from the natural dangers of the road, from transition from rail to ship-board, and from ship-board again to rail, but, in the case of these exhibitions, aggravated by the confusion caused by sudden and extreme pressure on the usual accommodations of the transit; the provisions for which, more especially on the return of the works, are clogged by a sudden and overwhelming increase of freight, wherein the heaviest machinery and the bulkiest merchandise are of necessity mingled with statues and pictures, without proper arrangements for their separation and safety; while the very ports of shipment, perhaps, are wholly unprovided with sufficient means of lading and unlading. In the face of these dangers, it would hardly be prudent to recommend that these continental exhibitions of works of Art should be repeated except at very distant intervals, or that, in any case, Government should again undertake the risk and responsibility of transporting such fragile and precious objects as marble statues, or works covered by glass, whose breakage may at once destroy a priceless labour.

Conclusion.

In conclusion, it is almost unnecessary to add, that I have received every attention and courtesy from the Imperial Commission and its officers, in the discharge of the duties entrusted to me.

I have the honour to be, &c.

Rich. Redgrave.

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* The insurance cost 2,715*l.* 12*s.* 6*d.*, and the claim on the underwriters at Lloyd's amounts to 423*l.* 18*s.* 5*d.*

APPENDICES TO MR. REDGRAVE'S REPORT.

MR. REDGRAVE ON THE FINE ARTS ARRANGEMENTS.

APPENDIX (A.)

Appendix A.

REPORT on the ARRANGEMENT of the PICTURES, &c. contributed by GREAT BRITAIN and IRELAND to the PARIS UNIVERSAL EXHIBITION.

Report on arrangement.

HAVING been deputed by the Lords of Her Majesty's Committee of Privy Council for Trade to proceed to Paris to aid Mr. Redgrave with our advice as to the hanging and arranging the Paintings, Architectural Designs, and Engravings contributed by the Artists of the United Kingdom to the Paris Universal Exhibition, we beg to submit the following Report of our proceedings.—

Description of exhibiting space.

On our arrival in Paris, we found that a long side hall of the main floor of the "Palais des Beaux-Arts" had been appropriated to the British Oil Pictures, and an upper gallery, on the same side of the building, to Water-colour Paintings, Architectural Designs, and Engravings.

This appropriation has been made partly because the British works were mostly of a cabinet size, and partly because the allotted space was that part of the building the farthest possible removed from apprehended danger by fire; which danger is, however, now greatly abated by the increased precautions adopted by the French Government.

The space allotted in the lower hall to the Oil Pictures is well lighted, and sufficiently low to prevent the necessity of hanging the works at a great elevation; it also affords the opportunity for all the works of this kind to hang in one continuity. The space, however, presented many obstacles to an agreeable arrangement of the pictures; it was broken into short lengths by numerous openings and doors, and interrupted by many projections.

The light and space in the upper gallery provided for the Water-colour Paintings, the Architectural Designs, and the Engravings, are quite unobjectionable.

Arrangement of the pictures.

There were, however, other difficulties to be surmounted in the prosecution of our labours. It might have been desirable to adopt an alphabetical arrangement, and to hang all the works of each Artist in close proximity; but this was found to be wholly impracticable, not only from the causes before mentioned—the divided nature of the space—but more especially from the extreme irregularity in the arrival of the works, many of which were not deposited in the building until the last week in April, while others by the same Artists had already been placed on the walls. This irregularity arose from the circumstance of the varied localities in England whence the pictures were obtained from the various proprietors.

Notwithstanding, however, the hindrances and obstacles, we trust that we may safely report that a very satisfactory arrangement has been made of all the works intrusted to us; that all are well seen; that the space allotted to British Art has been occupied with the least possible loss of room; and the whole completed and in order, so that nothing on our part prevented the opening of the "Exhibition of Beaux-Arts" on the first of May, had other circumstances permitted the adherence to this date.

General considerations.

It has long been felt desirable to exhibit a suitable collection of British Art on the Continent, where hitherto the works of the British School have been but little known. While we regret that the date determined by the Decree of the French Imperial Commission has prevented the exhibition of the works of many of our most eminent artists lately deceased, we still venture to believe that the present collection will redound to the honour of British Art.

At the same time, impressed with the many excellences of the French and other foreign works in this collection, we feel satisfied of the general benefit to art that will arise from the assembled Exhibition. Each will learn from all; many prejudices will gradually be eradicated; and we may trust in future to a better appreciation of one another.

In conclusion, we would venture to hope, that in the event of the British Government, as in the Great Exhibition of 1851, devoting a sum of money to

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the purchase of rare works contained in the Exhibition, the department of the Fine Arts, now, as a whole, for the first time, combined with industry in a universal Exhibition, may not be excluded from a proper share of consideration.

Appendix A.

May 1855.

Thomas Creswick.
Henry Warren.
Frederick Yeates Hurlstone.

Appendix B.

APPENDIX (B.)

Report on the Arrangement of the Works of Sculpture of Great Britain and Ireland in the Beaux-Arts Exhibition in Paris in 1855.

To the Lords of the Committee of Privy Council for Trade.

My Lords,

Exhibiting space.

When I arrived in Paris on the 10th of April last, according to your Lordships' request, in order to arrange, in concert with Mr. Redgrave, the Sculpture of the United Kingdom in the Beaux-Arts Department of the Universal Exhibition, its location in the building was not fixed. One of two situations was offered by the French authorities. We had the option of a portion of the great Hall of French Sculpture combined with that of other nations, or of an apartment rather scanty of both space and light parallel and close to the Gallery of British Oil-paintings, with which it directly communicated by two doorways.

Arrangement of the statues.

After some consideration, deeming it, for various reasons, better that we should stand alone, and that our Sculpture should group with the other art-works of Britain, so as to better illustrate her school, with the concurrence of Messrs. Cole and Redgrave, I accepted the latter arrangement from the French authorities, on condition of being allowed to re-colour the walls of the apartment differently, and to make what further special arrangements I thought fit; with the permission also of occupying with statues certain intercolumniations occurring on one side of the Gallery of British Oil-paintings, and also of placing groups of statues and single statues at certain points down the centre of the same gallery, and of placing busts against the columns on either side of the principal entrances.

The two latter propositions were at first demurred at by the French authorities, but eventually, by their kind permission, they were carried into effect. The staircase to the upper gallery, on the British side, was also granted for the arrangement of busts; in consequence of which I placed on the centre of the first flight of four or five steps facing the entrance, a bust of His Majesty Napoleon III. by Mr. Park, and on the centre of the next landing a bronze bust of Her Majesty Queen Victoria, by Mrs. Thornycroft, and a few other busts and two relievi on other parts of the staircase leading to the gallery of British water-colours, engravings and architectural drawing and models; just within which room I placed a case of medals.

Special apartment for British sculpture.

The collection contained in the special apartment of British Sculpture consists wholly of works of a poetic character. This room is lighted wholly by a line of upright windows tolerably high up on one side. The two side entrances, one toward either end, and which are opposite to the windows, open into the gallery of British oil-paintings. At first sight this apartment appeared very dark, but I judged that this was greatly owing to the sombre green with which its walls, like those of the rest of the Exhibition, were coloured. However this tint may suit a gallery of paintings where the wall is much covered, it does not appear calculated for a sculpture-room, where so small a portion is hidden. Moreover, its effect is harsh and cold, and it casts livid reflections on the statues, where cheering ones are more desirable; and these evils are enhanced where the light is scanty. With this impression, I judged that a different treatment of colour would do much toward lightening and adapting this apartment for sculpture. In accordance, the tint of its walls was changed to a warm grey, of an atmospheric character, that is, of a nature that retreats from the eye instead of advancing towards it, as do most violent colours, especially those wherein red has the preponderance. Its degree of force was regulated by the requirements

of affording sufficient relief to the general colour of the statues in the case in which it was applied, and at the same time of being sufficiently light for their outlines to merge and soften into the background. Too violent a contrast of shade and colour in the background of sculpture makes the statues look flat and stony, and gives to a marble figure an opaque appearance like plaster, whereas it is to be sought rather so to adjust the tints as to assimilate the effect of plaster to the soft and fleshy character of marble by rounding and melting the edges into the background.

Special arrangements.

I had accepted the honour of arranging the British Sculpture on this occasion with a hope that such top centre lights and other requisites would have been available that I should have been able to put in execution a cherished plan of mine for greatly enhancing the effect of sculpture by special arrangements of which much drapery forms a part, but on seeing the best advantages which could be afforded us on this occasion, I at once relinquished as impossible the idea of introducing it in this case, and addressed myself to do the best I could under the circumstances.

In carrying out these arrangements, the Sculpture-room being lighted wholly from one side, opposite the doorways, the wall of which, therefore, appearing very dark on entering the room, I had it coloured much lighter than the other sides of the apartment, so as to make it look the same tint, and to give the room a more cheerful appearance; also there being no proper light under the windows, I placed no works whatever on that side, but left it wholly for passage and for couches and seats placed against it opposite the statues, which are arranged in little more than the opposite half of the room, not more being available as regards light. Between the doors the statues advance to the light in two bays or waves, retreating from it in the centre. At the ends of the room also the lines of arrangement are waved. A waved line of arrangement was adopted to avoid the abrupt and mutually interfering effect of statues, when numerous and near together, coming at once upon the eye in a straight line. By a waved line, the statues are in turn presented in various views in passing through the room, and each has its front to itself as the spectator comes opposite to it. The works are placed on separate pedestals, of varied height, to meet the requirements of each work. Each work of the forward line may be walked round and seen in various views, and those few only are placed against the wall which present but front views, or require a low angle of light. The waved line afforded the means of accommodating each statue as to its front or the side whence it would receive the most favouring light, and also of adapting the angle of light to its requirement, giving, for instance, a more vertical light to the upright figures, and one more horizontal to those in recumbent positions.

These waves of arrangement left in front certain spaces, which are occupied by Mr. Baily's "Eve at the Fountain," and Mr. Gibson's "Hylas and the Nymphs." Mr. Macdowell's "Reading Girl" occupies also the point of another line that projects into the third space, which was obliged to be so arranged on account of the scantiness of room at that end.

The walls of the Sculpture-room being of a warm grey, the pedestals are covered with a cloth of a full green, as also the couches and seats, and the floor is painted of a dark reddish brown. I could not get it stained.

Works chosen for intercolumniations.

According to the permission that statues might be arranged in connexion with the oil-paintings, such works were chosen for the intercolumniations as were in some degree architectural, as Mr. Foley's "Hampden and Selden," which thus form a pair, one on either side of a doorway, entering on the centre of the British Gallery of Oil Paintings. Other statues occupy certain points down the centre of the gallery. There occur three times in the British part of the gallery, doorways, opposite each other, being the meeting of four ways. At two of these a symmetrical group of upright statues are placed, back to back, facing the four approaches. "The Concordia," by Mr. Marshall, a figure emblematic of the alliance between France and England, being one of these, and facing the principal entrance from the French side. Such figures were chosen for these groups as lost least by having their backs hidden, and although this arrangement was suggested greatly by the small amount of room at our disposal for sculpture, yet it did not appear to me that any of the works so placed were injured in effect in consequence. Had, however, the gallery been

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wide enough to allow of such arrangement without impeding the free circulation of the visitors, on which much stress was laid by the French authorities, I should have separated the statues in these groups more from each other, and supplied in their common centre a background of drapery, arranged in some simple ornamental form. The third crossway is occupied by Mr. Gibson's "Hunter."

Appendix B.

Four other statues, singly, occupy four other points down the centre of the gallery, opposite doorways existing only on one side of the way, no place in the centre being occupied by a statue except opposite a doorway. "The Houseless Wanderer," by Sir Richard Westmacott, is one of these, and occupies a point in front of one of the entrances to the Sculpture-room.

Six busts are also placed on pedestals, close to the columns of the three principal entrances. The pedestals in this gallery, as also those of the busts on the staircase, are covered with a cloth of a full red.

Tickets have been affixed.

In all cases tickets have been affixed, with the name of the artist, and the subject, in French and English. On the green pedestals in the Sculpture-room these tickets are of the warm grey of the wall. On the red pedestals, in the Gallery of Paintings, they are green, of the same colour as the wall there, the lettering, in all cases, being in gold.

Number of works.

The Sculpture-room contains thirty-five works, viz., thirty statues, two poetic busts, and three relievi.

The Painting Gallery accommodates twenty-five works of sculpture, viz., two groups of four statues each, and five single ones down the centre; also six statues in the intercolumniations, and six busts close to the columns.

Arranged on the staircase are ten works, viz., eight busts and two relievi; and in the upper gallery is placed a case of medals.

The examples of Sculpture from the United Kingdom thus amount to seventy-one.

Ready by the 1st May.

The arrangement of the Sculpture was completed by the 1st of May, with the exception of the non-arrival of two works, which were delayed at Dunkirk, but for which pedestals were ready and fixed.

I beg to add, that I met with the greatest civility and kindness on the part of the French authorities, and though several of the arrangements we desired differed from their own conceptions, they gave way on each point.

I have the honour to be, &c.

JOHN BELL.

REPORT on the MEASURES taken for collecting and arranging the BRITISH OBJECTS.—By RICHARD A. THOMPSON, General Superintendent of Arrangement.

MR. THOMPSON ON THE INDUSTRIAL ARRANGEMENTS.

ALLOTMENT OF SPACE.

Local Committees.

THE preliminary measures necessary for securing a proper representation of the industry of Great Britain were commenced as early as June 1853. Associate trade and local committees were afterwards formed in the metropolis, and in the great manufacturing towns of the United Kingdom.

Division of space amongst exhibitors.

Demands for space in which to exhibit were mostly sent direct to the Department of Science and Art, Marlborough House, London, and then, as a general rule, referred to the various metropolitan and local committees who decided on the merits of the application, and sub-divided the space placed by the Department at the disposal of the committee, according to the merits of the productions proposed for exhibition.

Number of demands, and amount of space applied for.

The number of demands for space received at Marlborough House up to the 11th of August inclusive, was for the industrial classes 1,487, and for the fine arts 349, making a total of 1,836 applications. The area applied for amounted to 139,450 superficial feet of horizontal or floor space, and 81,873 feet of vertical or hanging space.

A classified list of these demands, together with the area required, was forwarded to the Imperial Commission on the 14th of August 1854, and in September the official allotment to Great Britain, amounting to 162,000 superficial feet, was received from them. This, on deducting sixty per cent. for passages, left a net exhibiting space of 64,800 feet, which was allotted to the industrial classes only, and was divided between the two buildings in the proportion of 90,000 feet in the Palais de l'Industrie, to 72,000 feet in the long gallery annexed.

Nearly all the Colonial, and a great many miscellaneous demands, were received subsequently to this period.

Space for the Fine Arts was provided in a third building adjoining the long gallery of the Annexe.

The area allotted in the Industrial Buildings was, on several subsequent occasions, considerably increased, the total horizontal space occupied by Great Britain and her colonies amounting to upwards of 183,000 feet, including passage room.

The division of the entire space among the industrial classes was made by the Department of Science and Art,

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due consideration being given to the relative commercial value of the different manufactures, the importance of the various trades, and the actual bulk of the articles to be exhibited. It was then subdivided amongst the local and metropolitan committees according to the number of demands and importance of the manufactures represented, and was by these committees allotted to the individual exhibitors.

Number of exhibitors, and space occupied.

The following table shows the number of demands received up to the 25th of October 1854, the amount of space allotted to each of the industrial classes, the number of persons who actually exhibited, and the amount of space occupied :—

CLASS.	No. of Demands.	Space demanded in superficial feet.		Horizontal space allotted.	No. of actual exhibitors.	Horizontal space occupied.
		Horizontal.	Vertical.			
1. Mining and metallurgy	44	9,211	17	2,875	97	1,258
2. Forestry	3	72	...	40	7	54
3. Agriculture	52	20,586	...	4,660	32	4,735
4. Machinery in general as applied to industry	23	8,132	...	...	40	1,314
5. Machinery as a means of transport	82	8,004	...	12,000	89	4,238
6. Machinery for workshops	37	9,245	3	...	54	4,021
7. Machinery for woven fabrics	22	14,344	105	...	36	8,873
8. Arts relating to the exact sciences and to instruction.	39	661	41	500	74	1,470
9. Heat, light, and electricity	5	125	...	50	52	1,062
10. Chemical manufactures	109	3,377	777	1,500	123	3,863
11. Alimentary substances	15	300	...	150	19	224
12. Hygiene, pharmacy, surgery, and medicine	15	220	...	150	43	232
13. Naval and military arts	18	1,158	...	600	70	540
14. Civil engineering	21	1,507	...	600	29	1,234
15. Steel and its products	112	3,035	2,612	1,750	72	1,650
16. General metal work	144	8,979	2,374	4,050	66	3,226
17. Goldsmith's work, jewellery, and bronzes	20	2,534	4	1,200	30	2,942
18. Glass and pottery	40	6,706	2,047	3,400	42	3,585
19. Cottons	163	14,801	9,689	5,000	62	5,774
20. Woollens and worsted	127	8,812	13,908	3,650	77	2,419
21. Silk	59	1,728	2,415	1,210	33	1,044
22. Flax and hemp	59	3,826	5,240	1,850	60	1,371
23. Hosiery and carpets	73	2,337	36,871	1,475	77	1,258
24. Furniture and decoration	49	3,610	2,390	1,625	51	1,915
25. Articles of clothing, objects of fashion and fancy	121	2,617	159	1,200	111	1,127
26. Printing and Photography	67	992	3,155	500	86	2,249
27. Music	22	2,013	...	800	18	592
28. 29. 30. Fine Arts	349	1,100*	12,000*	2,064	299	2,064
Totals	1,890	139,452	93,873	53,029	1,834	65,234

* This space was demanded by the British Commission after the separate applications of the various artists had been considered by the Committees for Fine Arts.

It will be perceived that the number of exhibitors and the space actually occupied in each class is not in accordance with the number of demands and the space originally allotted.

Causes of difference between the amount of space originally allotted and the space occupied.

This discrepancy arose from several causes, such as the withdrawal at the last moment of many manufacturers to whom space had been allotted; the distribution of the space thus resigned amongst numerous applicants whose demands for space had not been sent in until after the time prescribed by the Board of Trade for receiving such demands; and the allotment of space for important objects of manufacture and science not represented, for which, in order to secure a creditable representation, the Board of Trade requested the co-operation of various scientific bodies and private individuals, and voted considerable sums of money in order to enable them to carry out the object intended.

The display of Philosophical Instruments formed by the Royal Society, and the collections of Raw Produce exhibited by the Board of Trade were the results of such co-operation.

Another cause of discrepancy between the proportions of the space originally allotted and that occupied by each class was, that the French authorities took upon themselves to re-arrange the British catalogue according to their own views of the system of classification adopted, transferring many exhibitors from the classes in which the British authorities had placed them, to others which they considered more suitable; for instance, kitchen ranges, tallow candles, galvanic batteries, were respectively transferred from Classes 16, 10, and 8 into Class 9 as manufactures relating to the economical production of heat, light, and electricity.

Demands from the Colonies.

The demands for space from our Colonies are not included in the foregoing Table as information sufficient to make a classified list of their contributions did not arrive until a much later period of the proceedings. Some in fact were only received a few days prior to the proposed opening of the Exhibition.

In one case, that of Canada, it was found that the space reserved was totally insufficient to accommodate the fine collection forwarded from that colony. This difficulty was, after some little delay, overcome by the Americans resigning to the Canadian Commissioner, with the consent of the Imperial Commission, a portion of the space they were themselves unable to occupy.

Colonial exhibitors.

The following Table shows the relative number of exhibitors in each class, and the space occupied by each colony :—

Class.	Australia.		British Guiana.		Canada.		Cape of Good Hope.		Ceylon.		Jamaica.		Mauritius.		Van Diemen's Land.		Victoria (Australia).		India.		Bahamas.		Barbadoes.		New Zealand.	
	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.	Number of Exhibitors.	Amount of Space occupied.
1	74	871 superficial feet.	6	357 superficial feet.	53	3,153 superficial feet.	7	169 superficial feet.	4	346 superficial feet.	3	483 superficial feet.	1	117 superficial feet.	11	429 superficial feet.	5	289 superficial feet.	18	3,592 superficial feet.	1	198 superficial feet.	1	84 superficial feet.	1	117 superficial feet.
2	38		22		27		10		11		9		4		33		4		76		1		—		2	
3	31		11		43		7		9		4		5		10		7		10		—		1		3	
4	—		—		6		—		—		—		—		—		—		4		—		—		—	
5	2		—		14		—		—		—		—		2		3		6		—		—		—	
6	—		1		13		—		2		—		—		—		3		6		—		—		—	
7	1		—		2		—		—		—		—		—		—		22		—		—		—	
8	4		—		3		—		1		—		—		2		2		14		—		—		—	
9	1		2		4		—		—		—		—		2		—		1		—		—		—	
10	7		3		24		3		2		4		2		6		1		26		1		1		1	
11	23		18		23		6		5		6		24		6		2		17		1		—		—	
12	8		8		8		2		2		4		2		2		1		3		—		—		—	
13	3		6		7		1		4		1		1		2		—		54		—		—		—	
14	3		—		31		—		2		—		—		1		1		7		—		—		—	
15	7		1		8		—		2		—		—		—		—		4		—		—		—	
16	1		1		3		—		1		2		—		2		2		22		—		—		—	
17	—		—		1		2		—		1		—		1		1		63		—		—		—	
18	3		—		1		1		1		2		1		1		—		4		—		—		—	
19	3		1		1		—		—		1		—		—		1		44		—		—		—	
20	—		—		—		—		1		—		—		—		—		35		—		—		—	
21	2		—		9		—		—		—		—		—		—		44		—		—		—	
22	5		5		—		2		1		1		1		2		—		9		1		1		1	
23	1		—		3		1		2		—		—		—		—		27		—		—		—	
24	2		1		11		—		1		1		—		2		—		33		—		—		—	
25	16		8		10		3		17		8		1		6		3		30		1		—		1	
26	17		1		25		1		5		1		3		18		5		11		—		—		—	
27	2		1		18		—		1		—		2		7		—		6		—		—		—	
	251		95		348		46		80		45		24		118		36		599		5		3		10	

On receipt of the ground plans of the Exhibition and the official allotment of space, measures were immediately taken to prepare a suitable plan of arrangement for the different classes in the two buildings, and when it was completed, tracings of the portions allotted to the various local and metropolitan committees, stating the height of the divisions, width of the counters, passages, &c., were forwarded to them, with a letter requesting that the allotments made to individual exhibitors by such committees might be marked on the tracing sent to them, which was to be returned to Marlborough House.

Plans of arrangement.

From these tracings a general plan of the English portion of the Exhibition showing the exact situation of, and the amount of space allotted to each exhibitor was prepared, so that the position of every exhibitor was fixed before the goods were sent from England; this has been always found a most useful, if not absolutely indispensable step to insure punctuality.

The time having arrived for the goods to be shipped to France, and arranged in the several buildings appointed to receive them, the executive staff was gradually removed from London to Paris, convenient offices having been previously secured at 14, Rue du Cirque, contiguous to the Exhibition building.

Reception of Goods in Paris.

A ground plan, hereafter spoken of, shows that the British goods were arranged in three very distinct positions; one being in the Palais de l'Industrie in the Champs Elysées, and the other two at the extreme ends of a supplementary building, called the Annexe, by the banks of the Seine.

Reception of goods in Paris.

By regulation No. 5 of the Imperial Commission, the reception of goods was to commence on the 15th of January, and terminate on the 15th of March; the time, in a few exceptional cases, to be extended to the 15th of April; but in consequence of the backward state of the arrangements in the Palais, and the incompleteness of the roof and flooring of the Annexe, this regulation could not be persisted in: nearly all the French contributions, and many from foreign countries, were received at a much later period, and in fact goods were admitted into the Exhibition almost up to the period of its closing.

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Reception of goods in Paris.

The following table shows the number of packages, date of shipment, and weight of the English contributions :—

Date.	No. of Packages.	Weight.			
For the week ending—		*Tons.*	*cwts.*	*qrs.*	*lbs.*
March 15th	276	54	10	1	8
„ 22nd	312	88	10	0	24
„ 29th	379	113	8	2	24
April 5th	1,085	212	12	2	9
„ 12th	949	183	19	2	14
„ 19th	883	146	2	3	15
„ 26th	629	133	1	1	3
May 5th	480	59	15	1	26
„ 12th	214	61	7	0	20
„ 21st	108	25	19	2	24
„ 28th	92	20	4	1	15
June 5th	114	17	4	1	10
„ 12th	88	11	18	1	3
„ 19th	59	42	4	3	26
„ 26th	111	23	9	3	2
July 3rd	80	17	11	1	11
„ 10th	77	13	4	1	24
„ 17th	65	11	16	0	15
„ 24th	37	6	11	3	1
„ 31st	68	13	13	2	13
Aug. 7th	43	5	19	1	17
„ 14th	78	13	2	0	20
„ 21st	32	2	13	0	6
„ 28th	28	4	16	2	14
Sept. 4th	22	3	14	0	3
„ 11th	19	6	6	1	15
„ 19th	17	3	7	1	4
„ 26th	14	1	3	1	2
Oct. 3rd	7	0	17	0	16
„ 10th	10	0	16	2	7
„ 17th	11	1	17	3	23
„ 24th	5	0	17	0	19
„ 31st	19	3	15	1	2
Nov. 7th	2	0	4	3	1
„ 14th	6	1	8	0	9
Dec. 1st	1	0	1	0	0
Total	6,319	1,303	7	0	25

Means employed in unloading the waggons.

It is a remarkable fact that there was a total absence of all the usual mechanical appliances in Paris for moving large and heavy packages, not a single crane being provided for that purpose, consequently the work of unloading the waggons was of the most laborious description.

Moving and lowering heavy weights by hand must of necessity involve considerable risk of damage, and great loss of time.

The general arrangements for the reception of goods at Paris were as follows:—Some of the porters ascended the waggon

to the top of the packages, and lowered down by hand to other porters beneath them such cases as they could lift; if too heavy for them to move, the packages were slid down a plank, and no precautions were taken to break the force of the concussion on reaching the ground. If very heavy indeed, the packages were unceremoniously thrust from the waggons. Packages of several tons in weight were thus unloaded. The damage done through this cause was very great; the loss to English exhibitors by breakage of glass alone amounting to several hundred pounds.

The French Executive preferred to receive the goods at only one door in the Palais, and for a long time only at a single entrance in the Annexe. The doors for the reception of goods were situated at the western ends of both buildings, whilst the space allotted to England was, with the exception of the machinery portion, mostly at the eastern end, consequently our packages had to be carried, or wheeled on trucks, the whole length of the building through the space allotted to other countries, and over a floor but ill calculated to bear heavy weights, to the great annoyance of our neighbours and with inconvenience to ourselves. This will be better understood by reference to the accompanying plan of the building.

In the Annexe, the delays arising from this cause were most serious, packages of all shapes and descriptions, and belonging to exhibitors of all nations, became piled up together in one confused mass; and hundreds of English cases intended for the east end of the building, being nearly three quarters of a mile from the place destined to receive them, had subsequently to be re-carted from the western end of the building, and weeks elapsed before the packages were sorted.

The goods naturally came from the railway to the Annexe sorted, those of each country by themselves, and as the building was of great length, it would have been easy to have deposited the goods of each country on its own site; but, by the plan adopted, the natural separation was superseded, and the confusion followed which has been mentioned.

Distribution of packages in the Exhibition.

By regulation No. 27 of the Imperial Commission, the French authorities undertook to distribute the packages as they arrived at the exhibition, and deposit them near the places allotted to receive them, but the delay was found to be so great that it became necessary to organize a gang of men for the special service of British exhibitors. These men were kept in the pay and employment of the English Com-

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mission until the final closing and clearing out of the Exhibition.

Classification and Arrangement of Goods.

From the unavoidable distance between the different buildings, the divided nature of the allotments to each country, and the unsuitableness of some portions of the building to the class of goods to be placed in them, the classification of objects, either geographically or systematically became impossible.

Thus it will be seen on reference to the ground plan of the Exhibition, that the space allotted to England was situated in not less than nine distinct places, namely, the Beaux Arts, the Palais, Palais Gallery, east end of Annexe, north Gallery of Annexe, south Gallery of Annexe, west end of Annexe, the Rotunda, and the space outside the building.

These different portions could not be visited without passing through the allotments of almost every other country contributing to the Exhibition.

The Fine Art section might, perhaps, be considered as a separate exhibition, the building being detached from the industrial portion, and a distinct charge being made for entrance.

Classification of objects in the different buildings.

The French authorities, in determining the place to be occupied by the industrial classes in the two buildings (the Palais and the Annexe), placed Classes I. to XI. inclusive, consisting of raw produce, machinery, alimentary substances, chemical manufactures, philosophical instruments, and manufactures relating to heat, light, and electricity, in the Annexe, and the remaining sixteen classes, considered more as manufactures proper, in the Palais; but owing to numerous causes, such as the backward state of the building of the Annexe, the porous condition of its roof, and the objection of countries occupying small spaces to have their contributions divided, this arrangement could not be retained, and portions of most of the elementary classes intended for the Annexe were arranged with the manufacturing classes in the Palais.

Difficulty in providing vertical space.

The large amount of vertical or hanging space demanded rendered it absolutely necessary that numerous walls or partitions should be constructed. At the same time, it was felt that owing to the great breadth under the galleries and the insufficiency of the lighting of the building in that part, such walls would be greatly detrimental to the proper inspection of articles exhibited.

To meet this difficulty, and prevent as much as possible the construction of partitions in close proximity to each other, it was determined to arrange the space when practicable in courts, placing the solid goods in the centre, and the soft goods requiring vertical space round the sides.

On the arrival of the Executive staff in Paris early in March, steps were immediately taken for marking on the floors of the Palais the plans of the counters and partitions to be constructed and furnished gratuitously to exhibitors by the Imperial Commission.

Platforms constructed of a less height than the counters were considered as not coming within the regulation No. 28, and were therefore paid for by the British Commission.

Arrangement of articles in the nave.

The plan or arrangement of the nave, or that portion of the Palais extending from column to column in the great central hall, was made by the Imperial Commission, and its adoption as regards the English portion was strictly insisted on, the slightest deviation from it being objected to. A considerable amount of space was lost by this arrangement, and exhibitors were put to great expense in glazing and fitting up large spaces that could not be used for exhibiting purposes.

Unfortunately the British exhibitors were too prompt in their arrangements, and had ordered their fittings before the French exhibitors had commenced the erection of theirs, so that when these stringent measures were relaxed in favour of the French exhibitors the British exhibitors could not derive any advantage therefrom.

Construction of tunnels for the purpose of ventilation.

Great delay in the arrangement of the goods was caused by the cutting, within a fortnight of the 1st of May, of two large tunnels for ventilating purposes through the space allotted for foreign contributions. These tunnels were commenced in April, and not only stopped the work of arrangement going on, but necessitated the undoing of much that was already completed. The flooring was taken up, and counters removed.

The work of the tunnels and the re-flooring of the English space was not completed until the 26th of April, four days before the proposed opening of the Exhibition. Each tunnel was eight feet in depth and six feet in width, and they extended in two parallel lines through the allotments of England, Austria, Prussia, Belgium, Wurtemburg, and Saxony. Instead of bringing fresh air into the building the contrary was the case. Exhibitors who had close glass-cases over the ground through which the tunnels passed were obliged to paste up the apertures in the flooring to prevent the effluvia from injuring their goods. These

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tunnels were both cut through the space allotted to foreign exhibitors, causing great delay and inconvenience, and some injury to the partly-arranged contributions. It was to be regretted that the other side of the building allotted to France had not been used, as there the tunnels might have been constructed without inconvenience or injury to anyone, as no works of arrangement had been commenced.

Removal of empty packing cases.

The empty packing-cases were removed from the Exhibition every morning and stowed away in a large building hired for that purpose by the British Commission.

Causes of Delay.

Postponement of the opening of the Exhibition.

The opening of the Exhibition, which was to have taken place on the 1st of May was from many causes postponed until the 15th.

The Beaux Arts arrangements were sufficiently complete; but the Palais was in a very unfinished state.

The opening of the Annexe and Rotunda did not take place until a much later period.

Punctuality in opening at the time specified should be, on any future occasion, most rigorously adhered to. The non-fulfilment of the Imperial Decree, announcing the opening of the Exhibition on the 1st of May, was the cause of great dissatisfaction to foreign contributors, a great many of whom had journeyed to Paris for the express purpose of arranging their goods and attending the opening ceremony.

The announcement by the French authorities of the postponement of the opening from the 1st to the 15th of May was made at so late a period, namely, the 27th of April, that it was not possible to communicate to exhibitors the alteration decided on by the Imperial Commission in time to save a useless journey to Paris.

The English portion, though far from being finished, would have presented a good appearance on the 1st of May, as many of the exhibitors were in Paris, and the goods were being rapidly unpacked and arranged. Nor would the contributions of France have been in a much more backward state than they were on the 15th of May.

Directly the announcement of the postponement was made the work of arrangement, which for the last few days had been going on rapidly, come to a stand-still, so that little advantage was gained in this respect by the alteration.

On the other hand, the foreign contributors who, believing in the inviolability of the Decree, kept strictly to the regulation of the Imperial Commission, and had completed their

fittings and unpacked and arranged their goods, were placed in a worse position than those who, by their neglect and indifference, had jeopardized the success of the whole undertaking. Their goods were left unprotected, and exposed to all the dust and dirt caused by the fitting up of the stalls of their dilatory neighbours. The Exhibition scarcely, if ever, recovered from the bad effect produced throughout Europe from this cause.

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Some of the principal causes of delay that prevented the English arrangements being completed by the 1st of May were, in the first place, the floor of the Palais which had been laid down as a close floor, without apertures for the dust to escape through, being found so objectionable that it was determined to take up and relay it. This operation was commenced in the English portion on the 31st of March, and was not completed until the 26th of April.

Causes of delay.

Secondly, the cutting of the two great ventilating tunnels before mentioned through the English space ; this work was not completed until the 26th of April.

Another and serious cause of delay was the non-fulfilment by contractors of their engagements with exhibitors in the preparation of their glass-cases and fittings ordered in Paris. There were very few instances of the works contracted for by the Parisian houses being performed within or even near the time specified in their agreements.

And lastly, the failure of the chief contracting carpenter in the construction of the necessary rough counters and partitions, as promised to exhibitors in Article 28 of the regulations ; in fact, the last of the partitions was not commenced until the 11th of May.

In the Annexe, the state of the building rendered any attempts at arrangement totally impossible. At the western end, devoted to machinery, neither roof nor flooring were finished, and the construction of the columns for carrying the shafting, which were of a most stupendous character, was not completed until after the 1st of May. At the east end of the Annexe the gallery staircases and the rough counters were in progress of construction on the day fixed for the opening of the Exhibition.

Backward state of the Annexe.

The Exhibition.

The Exhibition of the Beaux Arts and a part of the Industrial Buildings were opened to the public on the 15th of May, the industrial portion being still in a very unfinished state.

Opening of the Exhibition.

The Annexe, Rotunda, and outside buildings were not opened until a much later period.

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The exhibitors of machinery in the Annexe had to contend against many disadvantages. Their goods arrived before the building was ready to receive them; there were no mechanical appliances for moving heavy pieces of machinery; the backwardness of the foundations, flooring, and shafting, prevented the fixing of the machinery; the unsatisfactory state of the roof permitted the rain to penetrate in all directions; and, finally, when all these difficulties had been surmounted, and the machines erected, the delay and insufficiency of the supply of steam to work them, which was so inadequate that the whole of the English machinery could rarely be put in motion at the same time, and never for any very long period.

Duration of the Exhibition. Number of visits.

The Exhibition remained open 198 days; the number of visits to the industrial portion was 3,626,934, and to the Beaux Arts 906,530 – total number of visits 4,533,464.

The number of season tickets sold was, for the industrial buildings 4,617; for the Beaux Arts 170.

Receipts.

The total receipts were 2,941,668 francs, equal to 117,666*l.* 15*s.*

Preparations for the closing ceremony.

The nave portion of the Palais was closed to the public on the 1st of November 1855, in order to allow of preparations being made for the ceremony of distributing the prizes, and the final closing of the Exhibition on the 15th.

The clearing out of the articles exhibited, and the construction of seats and platforms for this occasion, was an extraordinary performance considering the magnitude of the work, and the short time taken to accomplish it, and furnished a proof, that had proper measures been take at the commencement, the Exhibition might have been opened with punctuality and success.

The Exhibition was formally closed by the Emperor in person on Thursday the 15th, and re-opened the next day for a series of concerts, and was kept open for that and other purposes until the end of the month.

Juries;

Owing to the distance between the several buildings, the scattered nature of the arrangements, and other causes, the work of the juries was one of great labour and difficulty.

Notices stating the time and place of meeting for each jury were furnished to the Commission daily, and were printed and distributed among exhibitors and their agents, and also posted up on the English Bureaux in the Palais and Annexe; appointments were made, and exhibitors requested to be in attendance at stated hours to open their glass-cases, and give any explanations that might be required, but for reasons before stated, great difficulty was experienced in keeping these appointments, and it frequently happened that

the exhibitors had left before the juries arrived, consequently another appointment had to be made, or the goods were inspected without opening the glass-cases, to the great disadvantage of the contributor.

The following table shows the number of exhibitors, and the value of their contributions in each of the industrial classes from the United Kingdom; also the number and description of awards made by the juries.

their awards, &c., United Kingdom;

Class.	Number of Exhibitors.	Value of Contributions.	Awards of the Juries.					
			Grand Médaille d'Honneur.	Médaille d'Honneur.	First Class Medal.	Second Class Medal.	Honourable Mention.	Total Awards.
		£ s. d.						
1	97	2,454 0 4	—	1	19	19	16	55
2	7	670 5 0	—	—	1	—	—	1
3	32	6,073 18 0	—	5	10	13	8	36
4	40	9,187 5 0	—	1	4	11	8	24
5	89	15,602 4 1	—	—	6	9	20	35
6	54	5,705 8 3	1	1	10	12	5	29
7	36	4,813 6 0	1	1	11	10	3	26
8	74	8,599 9 5	—	2	5	7	7	21
9	52	5,155 5 0	1	—	6	10	7	24
10	128	4,005 5 5	1	3	28	27	21	80
11	19	533 2 3	—	—	2	7	3	12
12	43	2,580 8 6	1	—	8	11	8	28
13	70	8,782 10 0	1	—	17	3	9	30
14	29	1,763 2 3	2	—	8	8	4	22
15	72	6,892 3 2	1	3	18	23	11	56
16	66	7,888 12 8	—	—	13	22	15	50
17	30	520,186 18 10	—	3	8	4	2	17
18	42	24,506 2 11	1	—	9	16	1	27
19	62	10,436 8 1	2	1	13	17	4	37
20	77	10,207 8 0	1	2	18	11	8	40
21	27	2,186 4 4	—	1	10	7	4	22
22	60	3,439 15 3	1	1	3	10	5	20
23	77	7,794 8 7	—	3	18	23	10	54
24	51	7,283 8 6	—	2	6	13	10	31
25	111	11,456 4 6	1	—	9	32	25	67
26	86	5,830 17 1	—	1	33	23	15	72
27	18	1,593 0 0	—	—	3	—	1	4
31	Included in the above.		—	1	5	5	—	11
Totals	1,549	693,627 1 6	15	32	301	353	230	931

The number of awards in Class 3 exceeds the apparent number of exhibitors; this was caused by the jury awarding medals for goods placed in other classes, as for instance, specimens of flax exhibited in conjunction with linens in Class 22, by the Belfast Local Committee.

Class 31, Domestic Economy, formed after the opening of the Exhibition, consisted of articles remarkable for utility

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their awards, &c., British Colonies;

and cheapness, which were mostly selected from the goods exhibited in other classes.

TABLE showing the AWARDS of the JURIES to the BRITISH COLONIES.

Name of Colony.	Grand Médaille d'Honneur.	Médaille d'Honneur.	First Class Medal.	Second Class Medal.	Honourable Mention.	Total Awards for each colony.	Value of Contributions.*
							£
Bahamas . .	.	.	.	.	1	1	20
Barbadoes . .	.	.	.	1	.	1	—
British Guiana .	.	.	2	2	7	11	800
Canada . .	1	.	12	31	48	92	—
Cape of Good Hope	.	.	2	3	.	5	—
Ceylon . .	.	.	2	8	5	15	—
India . . .	.	.	12	37	42	91	50,000
Jamaica . .	.	.	3	5	9	17	—
Mauritius . .	.	.	1	3	10	14	—
New South Wales	.	1	8	8	21	38	6,000
Van Diemen's Land.	.	.	6	7	7	20	—
Victoria . .	.	.	3	4	4	11	—
Total Awards .	1	1	51	109	154	316	

their awards to workmen.

The following additional Awards were made to Co-operators and Workmen of the United Kingdom and her Colonies who were not exhibitors, but who had been connected with the invention, production, or arrangement of the articles sent for exhibition.

Grand Médaille d'Honneur.	Médaille d'Honneur.	First Class Medal.	Second Class Medal.	Honourable Mention.	Total.
4	1	27	56	42	130

* The value of the contributions has been given in every case in which it could be obtained from the proper authorities.

The foregoing tables have been compiled from the last corrected List of Awards, published in the "Moniteur" of the 8th of December 1855.

Clearing out of the Exhibition and Return of the Goods to England.

Return of empty packing cases to the Exhibition.

The first step necessary to be taken for returning the goods to England was, to bring into the Exhibition the empty packing-cases. This operation commenced on the morning of the 17th, and was completed on the evening of the 24th of November. The cases for the Fine Arts had all been sorted and re-delivered at the Palais of the Beaux Arts, prior to the 15th.

The packing cases, on their arrival in the building were placed as near as possible to the stalls of the exhibitors, whose goods were to be repacked in them. Some little confusion arose from exhibitors taking cases that did not belong to them, and also from neglecting to place, as they had been requested to do, their rotation numbers inside as well as outside their packing-cases. Consequently, if the direction label was rubbed off the outside, which was very frequently the case, it was not possible to ascertain to whom the case belonged.

Customs arrangements.

In order to facilitate the immediate removal of goods from the Exhibition, and economise the time of English exhibitors in Paris, endeavours were made to complete the necessary Customs arrangements for goods to be returned to England between the 1st and 15th of November.

Goods declared for consumption in France were allowed, on payment of the duties, to be removed from the Exhibition on and after the 1st of November.

Great credit is due to the officers of the Customs for the efficiency and simplicity of their arrangements, for the facilities invariably afforded, and for the energy and good feeling displayed on all occasions in the fulfilment of their duties.

Expenses for the carriage of goods from the French port to London.

Previous to the 15th of November a circular was forwarded to every exhibitor, announcing the close of the Exhibition, and stating that if the goods were repacked, and the Custom-house forms completed on or before the 8th of December, the Board of Trade would pay the expenses of the carriage from the French port to London, but that if the packing was delayed beyond that time, the expenses of carriage between the French port and London must be borne by the exhibitors themselves.

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But this regulation was not enforced on account of the Imperial Commission requesting exhibitors to permit their goods to remain undisturbed in the building until the 25th of November, a visit to the Exhibition being expected from the King of Sardinia.

Removal of goods from the buildings.

The French authorities, though making the request stated above, gave every facility to persons desirous of removing their articles immediately from the building, and for this purpose two doors were opened in the English department in the Palais, and two in the Annexe.

The work of repacking was, however, in some measure stopped in the afternoon, no hammering being permitted after two o'clock, in order to allow of concerts being carried on in the nave portion of the Exhibition.

Number and weight of packages.

TABLE showing the NUMBER of PACKAGES, and WEIGHT, of the GOODS returned to ENGLAND.

Date.	No. of Packages.	Weight.			
		Tons.	*cwt.*	*qrs.*	*lbs.*
For the week ending—					
November 12th .	107	18	4	3	7
„ 19th .	193	26	19	2	27
December 3rd .	153	31	15	0	12
„ 10th .	422	86	5	0	15
„ 17th .	709	99	17	1	3
„ 24th .	608	113	7	0	24
„ 31st .	299	50	17	0	17
January 7th .	645	144	8	3	15
„ 14th .	452	121	19	0	18
„ 21st .	389	68	9	1	24
„ 28th .	1	2	5	0	0
Totals . .	3,978	764	8	3	22

The Offices of the British Commission in Paris were closed to the public for the transaction of business on the 8th of December, due notice having been given to Exhibitors to the effect that after that date the business of the British Section would be transferred to Marlborough House, London.

RICHARD A. THOMPSON,
Superintendent of Arrangement.

REPORTS

ON THE

PARIS UNIVERSAL EXHIBITION;

BY

DEPUTATIONS

FROM

THE BELFAST CHAMBER OF COMMERCE,
ON LINEN MANUFACTURES;

HE BRADFORD CHAMBER OF COMMERCE,
ON WORSTED MANUFACTURES;

HE HUDDERSFIELD CHAMBER OF COMMERCE,
ON WOOLLEN GOODS, AND MACHINERY USED
IN THEIR PRODUCTION;

THE LEEDS CHAMBER OF COMMERCE,
ON WOOLLEN AND WORSTED FABRICS, AND IRON;

THE LIVERPOOL CHAMBER OF COMMERCE,
ON THE SAMPLES OF GENERAL PRODUCE, AND
COTTON.

LETTER from the BOARD of TRADE inviting the CHAMBERS OF COMMERCE of the UNITED KINGDOM to send DEPUTATIONS to the EXHIBITION.

LETTER FROM THE BOARD OF TRADE.

IN accordance with a Minute passed by the Lords of the Committee of Privy Council for Trade, the following form of letter was addressed to the various Chambers of Commerce throughout the United Kingdom:—

"BOARD OF TRADE.—(DEPARTMENT OF SCIENCE AND ART.)

"*British Section of the Paris Universal Exhibition of* 1855.

"14, Rue du Cirque, Paris,

"SIR, "9th day of August 1855.

"I am directed by the Lords of the Committee of Privy Council for Trade to request that you will bring before the notice of the _____ Chamber of Commerce, the various kinds of machinery for producing _____ manufactures, together with the manufactures themselves, which are exhibited in the Paris Exhibition, by France and other European countries.

"My Lords are given to understand that the progress of manufacturing production shown on this occasion, and its probable competitive influence on the markets of the world, will be found to be well worthy of the serious consideration of the producers of the United Kingdom.

"It is the opinion of their Lordships that much useful information would be likely to be obtained if your Chamber were to depute some of its members, possessing technical knowledge on the subject, to visit the Paris Exhibition, for the purpose of reporting in detail to the Chamber the result of their observations.

"My Lords have addressed similar communications to other Chambers of Commerce in the United Kingdom, and they consider that, should the suggestion be carried out, a series of reports on the industrial position and recent progress of Europe would be obtained by these means, far more practical and useful than any reports which the Board of Trade could hope to obtain itself through its own agency.

"I am directed to state that there is every reason to believe that it will be easy to obtain samples and prices of the manufactures from the various foreign exhibitors.

LETTER FROM THE BOARD OF TRADE.

"Such office accommodation in Paris as may be necessary for the purpose will be placed at the disposal of your Chamber, and every assistance which may be in the power of their Lordships to afford will be given.

"I have the honour to be, Sir,
"Your obedient servant,
"FRANCIS FOWKE, Capt. R.E.,
"Secretary.

"To the President of the Chamber of Commerce,
at _____."

Five only of the Chambers of Commerce adopted the suggestions offered in the above communication, and sent deputations to Paris. These Reports, presented to the Belfast, the Bradford, the Huddersfield, the Leeds, and the Liverpool Chambers of Commerce, contain the view taken by these deputations of the present industrial position of the world, with reference to the special subjects to which they confined their inquiries.

REPORT of the DEPUTATION appointed by the CHAMBER OF COMMERCE of BELFAST on the LINEN MANUFACTURES in the PARIS EXHIBITION. BELFAST CHAMBER OF COMMERCE.

AT a meeting of the Council of the Belfast Chamber of Commerce, held on Saturday, 1st September 1855, a letter received from the Board of Trade was read (see p. 107).

The following resolution was unanimously passed :—

Resolved :—" That a deputation be sent, in accordance with the request of the Board of Trade, to report upon the various kinds of machinery for producing flax manufactures, together with the manufactures themselves, which are exhibited in the Paris Exhibition, by France and other European countries ; the deputation to consist of Messrs. John Herdman, James Grimshaw, jun., and John Patterson."

At the Council meeting on the 6th Oct. 1855, the deputation appointed to visit the Paris Exhibition presented to the Chamber the following valuable

REPORT.

On our arrival at Paris, on the 15th of September, we received from the British Commission every facility for making the inquiries entrusted to us, and were in every instance, treated by the foreign contributors and commissioners with courtesy and attention.

The linen machinery exhibited was not very extensive. Machinery. The new patent machines for combing tow, and a hackling machine for long flax, by Messrs. Coombe & Co., of Belfast, were worthy of observation. Some power-looms for weaving linen deserved attention, as the trade here must soon adopt this system of weaving, in order to keep up a regular supply and uniform quality of goods.

The linen manufactures exhibited embraced a large range of qualities and prices, and nearly every nation in Europe had a fair representation of its various fabrics. Manufactures.

France presented the greatest number and variety of hempen as well as linen manufactures, and when we observed how large a portion of the French division of the building was devoted to these goods, we were impressed with the conviction of the important position the linen trade must hold in the manufactures of France. The goods exhibited were in almost every instance of excellent quality ; they had little starch or finish, made of a firm round thread of yarn, and, although well adapted for immediate use, were French linens.

Belfast Chamber of Commerce.

not so sightly as Irish linens. A great variety of drills, fancy goods, and damask, either all linen or mixed with cotton, wool, or silk, were exhibited, and from the great taste and ability displayed by the French linen manufacturers, there is little doubt that were not the trade crippled by the high duties on linen yarns, they would soon be able to rival any country in Europe, and compete successfully in the market of the world. At present, as far as we can ascertain, the French linen manufacture is only for home consumption, and little or none is exported.

Consumption of linen in France.

The home consumption of linen is, however, very great. Linen napkins, as well as table-cloths, are used at table by all classes. Linen is generally used for underclothing, and the linen blouse, either dyed or undyed, is the universal outer garment. In consequence of this general use, the linen manufacture of France is of great magnitude, being reckoned at 7 yards for each person, or about 250,000,000 of yards per annum. Estimating the value at 1¼f., or 1*s.* English, per yard, the annual value must be about 312,500,000f., or 12,500,000*l.* sterling. It is our opinion, after a careful examination, that the same fabrics could be produced in Ireland and Scotland at 20 per cent. less, on account of the lower price of our linen yarns, which are now excluded from France by prohibitory duties.

Use of linen by French army and navy.

An interesting portion of the French linen goods is the various descriptions used for the army and navy. In both these services, the shirts, trowsers, sheets, &c., are all linen, as the Government wisely judges that, though the first cost may be a little higher than cotton, yet, that the greater strength and durability of linen makes it much the cheaper article to expend the public revenue upon. We were informed that the other continental nations also use linens for the same purpose.

Adoption of linen for British army and navy.

Should the authorities here adopt the use of linen for the British army and navy, we consider it would be a saving to the nation, and would, of course, have a beneficial effect upon the linen trade. We requested the British Commission to procure for us the statistics of the linen fabrics supplied to the French army and navy and also patterns; but as yet have not obtained them.

Linen of Hanover.

The linens of Hanover were well represented, and we examined the various qualities, but did not observe anything in them that called for particular remark.

Linen of Wurtemburg, Saxony, and Rhenish Prussia.

Wurtemburg, Saxony, and Rhenish Prussia exhibited a great variety of fabrics, from the coarsest to the finest. The lower and medium goods were similar to our own, but they

exhibited specimens of very fine linens, which we fear our manufacturers will have difficulty in equalling, being made of fine hand-spun yarn, regardless of expense, for the Russian market. BELFAST CHAMBER OF COMMERCE.

One piece equal to a	3800 4-4	was	15*s.* 0*d.* per yard.
„	2800 4-4	„	6*s.* 9*d.* „
„	2600 4-4	„	3*s.* 9*d.* „
„	2400 4-4	„	3*s.* 4*d.* „

In the linens made for exportation, they imitate the Irish marks and finish, and, in many instances, even the same paper ornaments used by the Irish trade. This is an interesting phase in the history of the linen trade, that Germany, from whom we borrowed the names of a great variety of our linen fabrics, and still export them under these names, is now, in her turn, borrowing from us, and imitating our goods, both in names, material, and finish. Some of the Saxon damask is beautifully fine; but we think, in design, some of the Scotch and Irish goods were quite superior.

Austria makes a very creditable display of linens and linen yarns. The latter were particularly clean, and free from imperfections. Some of the linens made in the prisons were as cheap as any other goods in the Exhibition; but whether they could be produced in quantity for export we did not ascertain. Austria.

Belgium makes a large display of goods, and appears a formidable competitor. We do not refer to the finer linens and cambrics, for which, at all times, there must be only a limited consumption, but in the lighter export goods, lapped and finished in the Irish form, and with Irish labels, the prices were quoted nearly as low as they can be purchased here. This is, no doubt, partly owing to the advantage they have gained by the permission to import duty free all linen yarns that are to be used for the manufactures of linen for export; but, while they are anxious to export cheap linen to foreigners, they appear to consider it for the good of Belgium that their own population should pay a high price for what they consume, as this boon is not extended to goods for home consumption. Belgium.

The exhibition of linens and canvas from Dundee, and damasks from Dumfermline, is highly creditable to the exhibitors. A considerable proportion of the goods are woven by the power-loom, and some of the large manufacturers have gone to great expense in displaying their goods advantageously, and prove they can meet successfully all competitors. The Dunfermline damasks are worthy of much praise, and we think our continental neighbours are surpassed not only in price, but in the beauty of the designs exhibited. Scotch linens.

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Irish linens.

Considering the magnitude of the Irish linen trade, and the fact that Irish linens are exported to all parts of the world, competing successfully with hostile tariffs, it created some surprise to find so scanty a supply of linen yarns and linen fabrics from Ireland, and the samples were so ill-arranged as to give an unfavourable impression of our spinners and manufacturers, and the linen trade generally. It would have required a much more general interest to have been awakened, and larger funds contributed, to have enabled a proper display to have been made. When we consider the advantages possessed by our manufacturers in their geographical position, allowing their goods to be exported with the various manufactures of England, their command of ample capital to carry on their business on the best principles, and their climate, which enables them to produce that pure white colour so essential in linens, we have no doubt that in price, colour, and finish our Irish linens can compete successfully with any others exhibited in Paris. Still it would have been most desirable that our superiority should have been better displayed, in a place where such a display might have led to important commercial advantages. In the Austrian department for linens the prices and lengths were put in German, French, and English money and measures; and even yet it would be desirable that a similar explanation should be put on the Irish goods exhibited.

Exertion to improve manufactures in Germany and Belgium.

It is our duty to state for the information of the Chamber of Commerce, that great efforts are making by Germany and Belgium to extend their export linen trade. We have already stated that they are imitating our finish and quality; they are, also, encouraging intelligent persons from this neighbourhood to settle in both countries, to instruct them in the various processes of spinning, weaving, and bleaching; and are, in many instances, introducing the power-loom to cheapen production and improve quality.

Advantage of power-loom.

A general opinion appears to prevail that as the power-loom gave a new impetus to the cotton trade, that a similar effect will be produced when it is generally employed in the manufacture of linen. It will require our manufacturers, therefore, to see that our continental neighbours do not get before them in the march of improvement, and we would recommend their adoption of every new principle of production that ensures economy and despatch, and so, by progressive advancement, maintain the advantageous position they now possess.

Suggestions.

We would take the liberty of suggesting to the Chamber the propriety of drawing the attention of our Irish linen

BELFAST CHAMBER OF COMMERCE.

manufacturers to the advantages they might derive from a careful examination of the highly interesting and varied display of linen manufactures exhibited at the Paris Exhibition.

Injury to France by Belgian treaty.

We cannot conclude our report without calling the attention of the Chamber to the fact that Belgian linen yarns and linens are still admitted into France under a special treaty, at much lower rates than the yarns and linens of Great Britain and Ireland. We annex a table, showing the rates paid on each article by each country, and it is worthy of note that the greatest difference in favour of Belgium is given on the description of goods most largely used in France. We think if this matter were properly brought before the Government of France, the tariff on linen and linen yarns would, at least, be assimilated to that of Belgium. When the treaty was made between France and Belgium, the latter was bound to keep up the same prohibitory duties as France, but a few years since a law was passed in Belgium permitting the manufacturers to import linen yarns free of duty, on giving a bond to export an equal weight of linen. We have reason to believe that this permission is largely availed of, and no doubt a good deal of our cheap linen yarn passes the Belgian frontier into France, manufactured into Belgian linen, and paying the low duties accordingly. It would appear to us to be more the interest of France to admit our linen yarns direct, at the low duties, and allow their own manufacturers to reap the profit of the manufacture.

Annual loss to France by the high duties on linen and linen yarns.

We have little doubt that the present Exhibition will lead the public mind in France to desire the advantages of a more liberal commercial system. For the article of linen the French nation pays at least one-fifth more than it would do under a moderate system of duties, the loss amounting annually to at least 2½ millions sterling, or 62½ millions of francs. The French Government loses a handsome revenue formerly derived from this source, while the aggregate capital employed in the flax spinning trade in France is not greater than the annual loss sustained by that nation in keeping up these prohibitory duties.

We have the pleasure to give the Chamber, for the information of the linen trade, a list of some of the articles examined by the deputation, with a description of the sets, the kind of yarns used in the manufacture, and where practicable, the prices.

We also hand over to the Chamber a copy of the Belgian treaty, which was at once given us, on application to the

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Customs authorities, and we have requested the British Commission to procure a copy of the French general tariff for the use of the Chamber.

John Herdman,
James Grimshaw, jun., } Members of Deputation.
John Patterson,

Belfast, 6th Oct. 1855.

Yarns from Great Britain.

Duties payable in France on Linen Yarns from Great Britain and from Belgium.

	Duties on English and Irish Linen Yarns.	Duties on Belgian Linen Yarns.
Unbleached linen yarns, weighing 6,000 metres, or less to the kilogramme (equal to No. 9's, and under English count), ...	₱ 100 kil. francs. 41.80	₱ 100 kil. francs. 17.60
More than 6,000 to 12,000, 9's to 19's ...	52.80	26.40
„ 12,000 to 24,000, 19's to 38's ...	86.50	44.08
„ 24,000 to 36,000, 38's to 57's ...	133.70	76.00
„ 36,000 or upwards, 57,000 and upward	175.70	89.60
Bleached Linen Yarns—		
6,000 metres, or less	59.20	28.60
6,000 „ to 12,000	71.80	39.00
12,000 „ to 24,000	113.80	61.30
24,000 „ to 36,000	173.60	102.20
More than 36,000	225.10	139.00
Dyed Linen Yarns—		
6,000 metres, or less	63.40	39.60
6,000 „ to 12,000	76.00	50.60
12,000 „ to 24,000	113.80	71.80
24,000 „ to 36,000	170.50	112.70
More than 36,000	212.50	160.00

Yarns of New Zealand.

Yarns of New Zealand.

Flax (Phormium Tenax) Abate and Jute—brown	65.50
„ „ „ bleached	87.50
„ „ „ dyed	86.50

	From the United Kingdom.	From Belgium.
Brown linens, less than 8 threads	60f. ₱ 100 k.	25.50 f. ₱ 100 k.
„ of 8 „	80 „	30.60 „
„ 9 to 12 „	126 „	55.25 „
„ 12 „	144 „	63.75 „
„ 13 to 16 „	201 „	89.25 „
„ 16 „	267 „	127.50 „
„ 17 „	287 „	144.50 „
„ 18 & 19 „	297 „	153.00 „
„ 20 „	342 „	191.25 „
„ above 20 „	467 „	297.50 „
Bleached or half-bleached linen, less than 8 threads	90 „	51.00 „
„ of 8 „	116 „	61.20 „
„ 9 to 12 „	191 „	110.50 „

	From the United Kingdom.	From Belgium.
Bleached or half-bleached linen,		
of 12 threads	219f. ℔ 100k.	127.50 f. ℔ 100 k.
„ 13 to 16 „	306 „	178.50 „
„ 16 „	417 „	255.00 „
„ 17 „	457 „	289.00 „
„ 18 & 19 „	477 „	306.00 „
„ 20 „	567 „	382.50 „
„ above 20 „	817 „	595.00 „
Dyed linens, less than 8 „	90 „	52.00 „
„ of 8 „	116 „	61.20 „
„ 9 to 12 „	146 „	72.25 „
„ 12 „	167 „	83.30 „
„ 13 to 16 „	216 „	102.00 „
„ 16 „	289 „	145.69 „
„ 17 „	317 „	170.00 „
„ 18 & 19 „	329 „	179.99 „
„ 20 „	380 „	223.12 „
„ above 20 „	537 „	357.00 „

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Yarns of New Zealand.

Particulars of various Fabrics at Paris Exhibition, September 15th to 22nd, 1855.

Various fabrics.

7205.—*Bégué & Tournier, à Pau.*

30 × 40 in. damask serviette, 14 × 23 threads, @ 27*s.* per doz.
28 × 36 in. old diaper, 10 × 10 „ „ 11*s.* 3*d.* „
30 × 38½ in. D. damask, 17 × 22 „ „ 27*s.* „
31 × 40 in. D. damask, 22 × 36 „ „ 75*s.* „

Ino Casse & Fils de Lille.

29 × 38 in. damask, full harness, 17 × 20 threads, @ 20*s.* per dozen. Fine and sightly, good patterns; many of the patterns have birds, which do not look well.

7296.—*Fournet, à Lisieux.*

31½ in. wide linens, 13 × 12½ threads. Flax, fine round thread, heavy half-bleached yarn, cleared and shrunk finished.
35½ in. creamed, 8 × 7 shots, 10*s.* tow.

7202.—*M. Beaulieu, à Fougères.*

35 in. linen, 12 × 11 threads, 3 boils, or creamed yarn, @ 11¼*d.*, 30-35 Lea.
29 „ „ 14 × 13 threads, @ 11*d.*, 40-45 „

7476.—*Henry Verdier.*

105 inch sheeting, bleached yarn, @ 13*s.* per yard, 25°° reed.
102 „ „ „ „ @ 6*s.* 3*d.* „ 260 porters, or 17°° reed
37¼ „ linens, @ 5*s.* 5*d.* „ 3,600 reed.

7208.—*Billon fils, à Fernay sur Sarthe.*

32 inch wide; natural colour linen duck; military "*tents à abri.*" Mill spun, yarn; double yarn warp; single weft. @ 16*d.* per yard.
32 inch military sheets for beds, 7 × 7 threads, @ 9½ per yard, 16 or 18 Lea. Natural colour.

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Various fabrics.

7198.—*Eugene Bary.*

Trellis brown handspun hemp.

35 in. herringbone drill for military trousers, 9 × 7 threads, creamed colour, @ 13½*d.* per yard.
35 in. linen, 15 × 13 threads, ⅔ white yarn, @ 18½*d.* per yard, 40-50 Lea.
35 in. linen, 24 × 17 threads, full white yarn, @ 4*s.* 7*d.* per yard.
37 in. linen, 13 × 12 threads, ¾ white yarn, @ 17½*d.* per yard.

16.—*Société industrielle du Royaume de Hanover.*

34 in. whitel linen, 15 × 14 threads, @ 2*s.* 2*d.* per yard. Beetle finish very dear; poor make of goods.
50 × 60 in. old diaper cloths, @ 5*s.* 10*d.* per cloth, 18 × 14 threads.

137.—*C. & H. Leeman, Wurtemberg.*

33 and 35 in. bleached mill spun linens, medium heavy.

15*d.*	17*d.*	19*d.*	25½*d.*
14 × 12	16 × 15	18 × 16	22 × 17 threads.

4-4th hand spun, first quality, like heavy medium linens.

34 in.	34 in.	35 in.	35 in.
19*d.*	22½*d.*	2*s.* 1½*d.*	2*s.* 4*d.*
17 × 12½	20 × 16	20½ × 19	22 × 20 threads.

23 and 24 in. linen handkerchiefs in cartoons.

@ 8*s.* 4*d.*	12*s.* 5*d.* per dozen.
18 × 16	22 × 19 threads.

7-8th linen platillas for exportation.
@ 22*d.* and 17*d.* De La Rue and Co.'s Paper Bands.

4-4th linens, 21-22 yards.

@ 12½*d.*	15*d.*	16*d.*
13 × 13	15 × 15	16 × 17 threads.

4-4th Bretânnas for exportation.

16 × 14	19 × 18	20 × 17 threads.
@ 15½*d.*	18½*d.*	21½*d.*

Some of the white linens put up like Irish, and same finish, De La Rue & Co.'s paper stripes, gold stamp, with "harp & crown," and stamped in red, "superfine soft finish."

C. & H. Leeman (make linen shirt fronts) intimate that they chiefly manufacture for exportation, that they employ about 120 looms, and that they have introduced into the country the finishing of linens after the Irish manner. Their principal places of export are—Italy, America, India, and the North of Europe.

63.—*Proelss aîné, à Dresde.*

Damask cloths and doylies, coloured warp and silk weft, good patterns, excepting the animals and birds.
68 in. square, white single damask, @ 6*s.* 3*d.*, 14 × 17 threads.
68 × 68 in „ double „ 22*s.* 6*d.*, 22 × 36 threads.

129.—*A. F. Lang, à Blauberen, Wurtemberg.*

33-34 in. heavy linens, medium finish.

@ 14½*d.*	16½*d.*
14 × 13	16 × 13 threads,

Corded bordered lined handkerchiefs.

17-18 in.	22-23 in.	18-18½ in.	24-25 in.
5*s.* 5*d.*	6*s.* 9*d.*	5*s.* 5*d.*	10*s.* 2*d.* per doz.
16 × 17-18	16 × 14½	16 × 17	20 × 18 threads.

Various fabrics.

35 in. white linen, 25-26 yards medium, soft finish.
14 × 14 15 × 14 16 × 16 threads.
14*d.* 16*d.* 18*d.*
Put up with De La Rue & Co.'s paper bands; goods stamped, "manufactured expressly for family use."
4-4th linens, 25-26 yards, good colours.
13 × 13 14 × 14 14 × 16 16 × 17 17 × 16 18 × 17 threads.
14½*d.* 15½*d.* 17*d.* 17*d.* 19*d.* 19*d.*
Linen handkerchiefs in cartons.
23 × 24 in. 25 in. 25 in.
14*s.* 6*d.* 15*s.* 17*s.* 6*d.* per dozen
19 × 16-17 20 × 17 21 × 20 threads.
35-36 in. white linen platillas.
17 × 16.
@ 19½*d.* per yard,
4-4th white linen, 25-26 yards
@ 14*d.* 16*d.* 18*d.* per yard.
14 × 14 15 × 15 16 × 16 threads.
7 inch fold, one hand paper, stamped, in English, "Free from any mixture of cotton; warranted superior soft finish; manufactured and bleached expressly for family use."
35 inch brown medium linens.
20½ × 18½ 24½ × 23 26 × 23 28 × 25½ threads.
20½*d.* 3*s.* 4*d.* 3*s.* 9*d.* 6*s.* 9*d.*
Prime well-made cloth, good selvages.

134.—*Pommer & Cie., à Urach, Wurtemberg.*

33 inch brown linen, dry-beetled, hand spun yarn.
6 × 6 threads, @ 4⅜*d.*
34-35 inch millwashed do.
6 × 7 threads, @ 5½*d.*
35 inch brown buckram, dry-beetled, hand-spun yarn.
6½ × 6½ threads, @ 5⅝*d.*
34 inch linen millwashed, do.
8 × 8 threads, @ 6$\frac{3}{10}$*d.*

1000.—*Springmann & Cie., Westphalia.*

22-23 inch linen handkerchiefs.
8*s.* 4*d.* 9*s.* 2*d.* 10*s.* 10*s.* 10*d.* 11*s.* 8*d.* 12*s.* 6*d.* 13*s.* 4*d.* 14*s.* 2*d.* 15*s.* per doz.
14 × 15 16 × 18 17 × 16 18 × 16 19 × 19 20 × 17 21 × 17 22 × 19 23 × 19 threads.
16*s.* 8*d.* per doz.
21 × 20 threads.

999.—*Société de Herford, Westphalia.*

4-4th brown linens, 38°°-30°° weft, @ 15*s.* per yard, hand-spun.

996.—*Fr. Piderit, Bielefeld.*

34 inch white linen, 23-21 threads, @ 2*s.* 7*d.* per yard. Good heavy linen, and well finished (chiefly for Russian and Prussian consumption; Russia takes *high*-priced goods). Prime and fair bleach.
33 inch yarn, bleached, heavy make, 19-17 threads, @ 2*s.* 2*d.* per yard.

981.—*C. Lichelbaum, à Insterburg.*

27½-28½ in. brown linen, dark natural colour, hand-spun.
11 × 10 threads, @ 5½*d.* per yard, made by the prisoners.
31 and 33 in. herringbone grey linen drill.
33 in. 31 in.
@ 7¼*d.* 5½*d.*

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Various fabrics.

994.—*Lueder & Kisker, à Bielefeld, Westphalia.*

33-34 in. double damask, 18 × 20 threads, @ 46*s.* 8*d.* per dozen.

990.—*C. G. Kramsta & fils, à Freybourg, Silesie.*

35-36 in. white linen, 24 × 20 threads, @ 4*s.* 4*d.* per yard. Fine damask cloths, but patterns inferior to the Irish or Scotch

979.—*D. Dresler, à Fickenhütten.*

15½-16 in. striped drill, @ 5*d.* 16 × 11 threads. Household toweling, shrunk finish, large home consumption.
31 inch, „ @ 7½*d.*, 17 × 12 threads.

1028 A. / 1427 *Isaac de Pick, à Nachod, Bohéme.*

30 inch linen, heavy make, 20 × 19 threads.
@ 11½*d.* per yard, grass bleach.
29 „ white linen, 11 × 12 threads, @ 4½ per yard.
29-30 in. „ „ 14 × 15 „ @ 5*d.* „

30 inch brown linen, 10 × 8 × 9 threads, @ 4*d.* per yard. Dry-beetled, heavy make, and well woven.
32 inch brown linen, 12 × 11 thread, @ 4⅔*d.* per yard. Dry-beetled. Used for blouses and sheets, mostly bleached.
36 inch brown linen, 16 × 16 threads, @ 8½*d.* per yard.
30 „ white „ 17 × 17 „ @ 8*d.* „

1015 / 1292 *L. Haupt, à Brunn, Moravie.*

30-31 inch gray drill (brown).

31 in.	31 in.
@ 25*d.*	22½*d.*
8 × 8	9 × 10 threads.

32 inch dry-beetled, 4½ × 4 threads.
31 „ half white linen, for soldiers' inside trousers, 7 × 7 threads, @ about 5½*d.* per yard.
32 inch white yarn, dry-beetled, for soldiers' shirts.
8 × 7 threads, at 8½*d.* per yard. Heavy make, 18 Lea.

1011 / 1431 *Gröger, frères, à Sternberg, Moravie.*

31-32 inch linen bed ticks, 19 × 11 threads. Herringbone, heavy make; striped in a variety of colours: blue, green, black, pink printed, brown, and white, also checked.
28 inch linen bed ticks, 19 × 12 threads, at 18¾*d.* per yard. Brown, with broad red stripes.
29 inch wide linen for women's dresses. 15 × 13, @ 14*d.* per yard; printed warp in two and three colours, showing flowers, and checked.

521.—*Rey aîné, à Bruxelles.*

48 inch brown linen, 4 × 6 threads, at 4*d.* per yard.
46 and 47 inch brown linen, 5 × 8 threads, @ 7*d.* per yard.
47 and 48 „ „ 7 × 9 „ 5¾*d.* „
30 inch wide, brown linen, millwashed, 15 × 15 threads, @ 9*d.* per yard.
32 „ „ heavy make, 14 × 14 „ @ 8¾*d.* „
33½ inch millwashed linen, heavy make, 14 × 14 „

506.—*H. Deroubaix, à Courtrai.*

7-8 white linen crea, 18 × 17 threads, @ 12*d.* per yard, "Crea à la Morlaix."
7-8 „ „ 15 × 17 „ 13*d.* „
35 inch wide Irlandas 16 × 14 threads, @ 11½*d.* per yard.
35 „ „ 17 × 15 „ 11¾*d.* „
35 „ „ 21 × 17 „ 14½*d.* „
35 „ „ 26 × 20 „ 18*d.* „
34 inch white medium linen, 28 × 21½ threads, @ 2*s.* 11*d.* per yard.
39 „ „ „ 14 × 13 „ 12¼*d.* „
Also tablecloths and napkins, old diaper and damask; Patterns nothing particular.
33-34 inch estopillas (white linen), counts 18 × 16 threads, @ 13¼*d.* per yard.

N.B.—The numbers of threads are given on a 37-inch glass, and the sterling prices per yard as nearly as possible.

Respecting the colours of the white linens, many of them are good whites; but we had no opportunity of ascertaining the strength of the cloth, whether or not it was as strong as the Irish bleach, nor can we state whether or not the continental bleachers can make fair colours during the winter months, which we are much disposed to doubt.

Belfast, 6th October 1855.

Report of the Deputation appointed by the Bradford Chamber of Commerce, on the Worsted Manufactures in the Paris Exhibition.

Bradford Chamber of Commerce.

The Council by a resolution passed on the 1st of October 1855, in accordance with the suggestions of the Board of Trade (see p. 107), appointed Messrs. Samuel Bottomley and Edward Waud, of Bradford, and Mr. John Wright Child, of Halifax, together with the Secretary, a deputation to proceed to Paris, for the purpose of examining the various kinds of machinery for producing worsted manufactures, together with the manufactures themselves exhibited in the Palais de l'Industrie.

Appointment of the deputation.

The deputation arrived in Paris on the 13th of October.

They were occupied on the 15th with a general survey of the whole of the Exposition, and in making the necessary arrangements for a systematic examination, and in endeavouring to procure free access to those articles which were enclosed in cases; and although Mr. Cole gave an order for their inspection, they only received permission to have the cases opened at a late period of the examination.

Examination of the goods.

The deputation were occupied several days in pursuing the object of their mission, and occasionally received the valuable assistance of the President of the Chamber, Samuel Smith, Esq., and other gentlemen from this district, who were at that time in Paris; and they also had the services of Messrs. George Howitt and Robert Smith, who have acted as the agents for the exhibitors from Bradford and Halifax.

After a general survey of the goods exposed, the deputation came to the conclusion that this district had nothing to learn from other countries as far as the manufacture of mixed wool and cotton fabrics is concerned, and they beg to congratulate the trade upon the high position it occupies in that department. However, on examining goods made of wool only, or of wool and silk mixed, the deputation are quite ready to acknowledge the superiority of the French and some other continental nations.

Conclusion arrived at.

Concluding that they were sent principally for the purpose of discovering the cause of that superiority, they devoted a large portion of their time in trying to find out, if it were possible, why we are unable to compete with our neighbours.

Superiority of French goods made of wool only.

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The labours of the deputation were naturally divided into four distinct heads, viz.—

1st. Wool.
2nd. Machinery; including machines for carding, combing, preparing, spinning, and weaving.
3rd. Tops, warp, and weft.
4th. Woven and dyed fabrics.

1st. WOOL.

Various wools exhibited.

No part of the exhibition has occupied a greater share of their attention than the wool exposed from all parts of the world, and, after giving a mere passing glance at the English and Australian wools, the qualities of which are too well known here to require any comment, they beg to call the attention of the trade to the annexed epitome of their observations upon continental, and more particularly upon French wools, many of which well deserve the especial notice of the staplers and spinners of this district.

French wools.

They are not aware that any important quantity of French wools has ever come into this market, although many of their sorts possess qualities which peculiarly fit them for our manufactures, and the deputation feel no excuse necessary for entering rather minutely upon this part of their investigation. The duty on exportation of wools being only nominal —namely, one penny farthing per hundredweight—there is no impediment on the part of the French Government to their being imported into England.

Of French wools there was indeed a great variety, many of them of beautifully fine and long fibre, suitable for combing purposes, and well adapted for the manufacture of warps; amongst others were noticed the following as deserving particular attention:—

No. 447. Colonie Agricole de Petit Bourg (Seine et Oise).—One specimen of wool grown in France from Cotswold sheep, imported in 1854, of a staple equal in length to Lincoln wool, but by no means of such intrinsic worth.

Another specimen from Cotswold sheep of an earlier importation, but greatly impaired, being very hard and harsh, and not at all suitable for the manufacture of Orleans or other low goods. From the appearance of this specimen it would seem as if the climate were unsuitable for such deep grown wools, hence probably its depreciation,

No. 627. Bergerie Impériale de Rambouillet (Seine et Oise).—Eight samples of well-bred merino wools, admirably adapted for weft purposes.

Prize Medal, London, 1851.

No. 636. Bergerie Impériale de Gevrolles (Côte d'Or).—Seven specimens of wool, six of which were of a very useful class, and well adapted for the manufacture of Bradford goods.

Also, one about four to five inches long in staple, of great lustre, and nearly equal in fibre to merino. All this class well adapted for warp. BRADFORD CHAMBER OF COMMERCE.

No. 654. Germay frères, à Ligny (Meuse).—A beautiful exposition of fine wools, suitable for warp and weft. Specimens of top, warp, and weft yarns, also exhibited, but no access for closer examination could be obtained.

No. 669. Graux, à Juvincourt (Aisne).—Washed and unwashed wools, among which was noticed one especial sort about four inches long, of ordinary South Down quality, but almost as lustrous as mohair and as soft as alpaca.

No. 685. Malingié Paul, à la Charmoise (Loire et Cher).—Exhibits wool very like those of the West of England. (6 prizes.)

No. 694. Parpaite, ainé, à Carignan et Messincourt (Ardennes).—A great variety of wool admirably adapted for warp and weft. (9 medals.)

Of Silesian and Austrian wools several cases were noticed, but as their nature is so well known to the trade, it will be unnecessary to enlarge further on them than by giving the numbers of those cases examined, and the names of the proprietors. Silesian and Austrian wools.

190. (Prussia) Administration de la Bergerie Royale à Frankenfelde (Brandebourg).
191. Collin, à Wollin près de Gramsow (Brandebourg).
192. De Dedovic, à Langen-Oels près de Zobten (Basse Silésie).
194. Heller, à Chrzelitz près de Zulz (Silésie).
198. Lehmann, à Nitsche près de Schmiegel (Posen).
204. Rudzinski de Rudno, à Liptin près de Katcher (Silésie).
207. Thaer, à Mœglin (Brandebourg).
238. (Austria) La Société Impériale d'Agriculture pour la Styrie à Gratz.
272. Cte. de Thun Hohenstein de Bodenbach.
815. (Prussia) Hanff and Cie., à Berlin.

The Tuscan wools presented no feature of usefulness to the worsted trade, and the Spanish wools, although well represented, are not of a class suitable to our trade. Tuscan wools.

Of Canadian wools, Messrs. Barber Brothers sent specimens well adapted for combing purposes. The deputation had not before seen any sample from our Canadian colony, and they think it probable that if the attention of the trade were drawn to this new source of supply, a large and mutually profitable business might arise from this favourable exposition. Canadian wools.

From India there were exhibited specimens of very ordinary character, and not at all adapted for worsted purposes. Indian wools

Australian wools were well represented; but for the reasons before stated no particular remarks were made on them; and the deputation have only to draw attention to one specimen of Van Diemen's Land wool, No. 32, exhibited by Messrs. Dickenson and Hewart, as a splendid specimen for warp purposes.

Bradford Chamber of Commerce.

Before closing their remarks on this the first division of their labours, the deputation beg to observe that, as far as wool is concerned, the superiority of the French merinos appears in a great measure to arise from the combination of their fine long wools for warp with colonial wool for weft.

2nd. Machinery.

There were no machines for washing wool exhibited worthy of any comment.

Carding engines.

Of Carding Engines, none were shown superior or even equal to those already in use in this district.

Preparing machines.

Of Preparing or Opening Machines, as distinct from carding machines, there were only two processes noticed by the deputation, one the ordinary sheeting machine, steam heated, and well known here (not numbered); the other on the principle of the figure heckle, which has been long known and used here in the flax and hemp trade, and occasionally for worsted, for the longer staples of which it appears to be well adapted.

Combing machines.

Of Combing Machines, three only deserve remark; two of which, Heilman's and Preller's, are well known in England; the other, Dujardin Collette, à Roubaix (No. 1549), in which there is one new feature, viz., that after the wool has been fed upon the circle, a working comb acts upon the ends of the fibres outside the circle, and the wool abstracted by this working comb is replaced with the noil end upon the circle. This machine was working at a disadvantage, inasmuch as the wool under operation was too long in fibre for the machine as then constructed or adjusted.

Drawing machines.

Of Preparing or Drawing Machines, there were none exhibited that were adapted for the long wools generally used in this district; but for fine short wools a class of machinery is used of which little is known here. In the first boxes of the preparing or drawing process, a double draft in each box is general, and the porcupine roller is common in all, even down to the roving; and oscillatory rollers to roll and consolidate the thread are substituted for twist.

The deputation did not observe any machine or throstle suitable for the spinning of long wools, although it is well known that such machines are sent from this district into France for that purpose.

Mule spinning.

Mule Spinning for fine wools appears to be all but universal; there were, however, no machines of this description shown equal to those which are now constructed for the cotton trade in England.

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Of Looms for weaving, those exhibited were generally of old construction; there were some exceptions, one of which is that of Armegaud, ainé, Paris (not numbered), a loom intended for figured goods, combined with a considerable number of healds, which were to be worked by a witch engine at the side of the loom, and a figure to be produced by a jacquard engine by electrical action; but this machine was unfinished when the deputation left Paris. Another is that of Jac. Grasmayer (Reutte, in Tyrol) which shows a mode of working sixteen treddles or healds by only two tappets; these are deserving of attention for the production of figured goods, combined with healds, or for working a large number of healds in a simple manner. Looms.

Of Jacquard Engines there were many examples, nearly all with wooden frames; but they deserve attention on account of the substitution of thin paper for cards, which is obviously of great advantage in elaborate designs. Jacquard machines.

These were accompanied by reading on, punching, and repeating machines, some of them of very excellent construction.

This completes the second part of the division—machinery connected with manufacture; but there is another machine used in the finishing of goods, viz., that of David Labbez and Cie., Sains-Richoumont, Aisne (not numbered), which deserves especial notice. It is a machine for removing noil or knot from the face of merinos and other fabrics after weaving. By this machine the superfluities are sheared or shaven off in a very peculiar manner, at the same time the ground is *raised* whereby a richer appearance is given to the cloth.

3rd. Tops, Warp, and Weft.

There were many excellent specimens of tops, apparently combed for the special purpose of show; but by whose machines and how many times combed the deputation could not, except in one instance, ascertain, nor had they an opportunity of learning the relative proportions of top, noil, and waste, but they believe the tops exhibited were much better combed than is usual for the general purposes of their trade. Tops.

Of the tops more particularly worthy of remark, the deputation noticed the following:—

No. 6,460. Prouvost et Cie., à Roubaix.—Thirteen specimens of white, four of coloured top; all exceedingly well combed.
The African bright.—The zigoe mottled like rainbow. All combed without oil.
The Egyptian very soft, and running to a brown grey.

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No. 6,063. Allart Rousseau et Cie., à Roubaix.—Twelve samples of white and one of brown top.

The Austrian and Silesian of very superior quality, all well combed; the noils generally short and nibby.

The Champagne wool runs a good length, and like South Down.

No. 6,364. Jejeune Mathon, à Roubaix—Case, presenting in top, Adrianople, English Down, St. Omer, Persian brown in yarns. All kinds of mixture and every variety of yarns, from No. 30 upwards, principally in cop, with hanks of mixed.

No. 6,151. Cauvet, à Chantilly (Oise).—Samples of top combed by Preller's and Schlumbergers's machines. Also a great number of warp and weft yarns single and twofold, with an assortment of embroidery. Altogether of superior quality.

No. 6,539. Tisserant, à Cirés-les-Mello (Oise).—A case of excellent samples.

No. 6,293. Hartmann et Cie., à Malmerspach (Haut-Rhin).—A good variety of warp and weft in spool and cop, very free from knots.

No. 6,417. Oriolle, fils, et Cie., à Angers (Maine et Loire).—A great variety of fancy yarns well got up.

No. 6,376. Lister and Holden, à St. Denis.—Very conspicuous in good top.

No. — Taturle, Lupin Seydoux, Sieber et Cie. (Cateau, Dept. de Nord).—A large exposition of wool, top, and yarns of the best description. The cloth very superior both in twill and satin, with class of colourings of the most excellent character.

No. 477. (Belgium) Francis Schepper, Loth, near Brussels.—A case containing eight specimens of top in different colours; also a great variety of mixed and other yarns, with samples of Orleans, lastings, &c. (this case was inaccessible to the deputation).

Warp and weft.

The *Yarns, Warp and Weft*, were of a very commendable class. The specimens of wool, top, and noil exhibited by Messrs. Lister and Holden nearly assimilated to those made in our own country, except that these, as well as all other specimens, are combed without oil; a mode of combing which appears to be general, from the lowest to the finest qualities exhibited.

Mixed yarns.

Of all kinds of *Mixed Yarns*, made from dyed wool and other materials, there was an endless variety, far beyond anything in use here. There was also a corresponding variety of knitting and embroidery yarns, all of which appear to be well got up.

Nearly all the specimens exhibited were mule spun, and they contained a great deal of twist, especially the warps.

4th. Woven and Dyed Fabrics.

Finished goods.

The deputation have devoted much care and attention to the examination of the various finished goods exhibited by French and other continental manufacturers, and have divided them under the following heads, viz.:—

1st. Fabrics composed entirely of wool.

2nd. Fabrics composed of worsted, alpaca, or mohair weft, in combination with cotton and silk warps.

The superiority of the French is as marked in the first-class as that of the Yorkshire manufacturers is in the second. In the building itself, no comparison could be instituted between the two, for of dress goods, the warp and weft of which are both wool, only a few pieces of lastings, sayes, and single twilled merino were shown by Bradford exhibitors.

In the article of double twilled merino, so extensively produced in France, not a single piece was shown by this district.

The same remark applies to fancy goods made from all wool. The deputation consider it unnecessary to dilate upon the beauty and excellence of the French and Saxon merinos.

French merinos.

It has been supposed that the French possess peculiar advantages for this important branch of the worsted trade, in the quality and spinning properties of some of the French wools, which render them peculiarly adapted for warps; that their method of sizing renders the yarns both flexible and soft; that their processes of preparing and spinning are superior to ours; and finally, that the drawback or bonus allowed by the French Government rendered competition on the part of our manufacturers a matter of considerable difficulty. It was the object of the deputation to discover whether the French do possess any such advantages, and having detailed the result of their labours under the different heads of wool, machinery, tops, and yarn, they leave it to the trade to determine whether this important branch of manufacture may not be successfully cultivated and extended in this district. The deputation are inclined to think that there are no insuperable difficulties to prevent the most perfect success.

The French system of drawbacks so imperfectly known here will be found to be much less formidable than is generally supposed, and the deputation beg to refer to the documents at foot, derived from authentic sources, and to the few observations they have considered it within their province to make upon them.

Fancy goods.

With reference to the fancy goods of all wool, and wool and silk, a few remarks will suffice. They are not goods sold to any very large extent in England, and their high prices will always be a barrier to their general sale. As to their elegance and beauty, there cannot be two opinions. The case, for instance, of Messrs. Ternynck, Frères, of Roubaix, (No. 6531,) is one in which there was scarcely a single objectionable piece, and the same applies to the goods shown by Messrs. Delattre, père et fils (No. 6202); the effects are

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produced undoubtedly in a great measure by the richness of materials employed, entirely regardless of cost, but also by that harmonious and felicitous combination of colours for which our neighbours have always been distinguished.

Some nice cloths of the "Lasting" kind, used extensively for the ladies' boot manufacture, and also some double warp merinos for ladies' mantles, were exhibited. The deputation deem both worthy of consideration as being adapted to the worsted trade of this district.

In all fabrics composed of worsted, alpaca, or mohair weft, with various combinations of cotton and silk warps, there was, as has already been observed, as great a superiority on the part of our own productions as the French can claim for their manufactures composed exclusively of wool.

No prices affixed to the French goods.

No prices were affixed to the French goods of this class, but from the fineness of the qualities, it might be concluded that they were rather goods made for the purpose of show than a veritable exposition of marketable productions.

Some goods exhibited from Prussia and Belgium, approached more nearly, though at a considerable distance, to the staple produce of this district.

Compared to the bulk of the productions of worsted goods the French manufacturers have only shown few goods for the use of the middle and labouring classes. The Bradford show consisted mainly of such goods, and those shown were not made specially for the Exhibition, but such as are usually found in the markets here.

Modification of French tariff.

The deputation have the authority of Mr. Howitt (to whose care the goods of this district were on both occasions entrusted) in stating, that, although the collection of goods was far less extensive and various than that of 1851, the interest taken in the department by the visitors generally has been infinitely greater than at that time If, as there is reason to hope, the result of the Exhibition should be a modification of the French laws, regulating the admission of foreign productions, the trade of this district will be greatly benefited by the opening of this new and immense market. The exhibitors will have then attained the grand object of their labour and expense, which was to show that excellence of manufacture could be combined with cheapness, and that goods well adapted to the wants of consumers could be produced at a cost which brought them within the reach of all classes of the community.

Dyeing.

With reference to dyeing, the deputation beg to observe that although no comparison can fairly be instituted between goods made of wool alone and goods made of mixed materials,

yet there was nothing to lead to the conclusion that our dyes had failed to keep up the requirements of our trade.

The exhibition by the Parisian dyers of all wool merinos and plain and figured satteens of fine qualities was indeed extremely beautiful; that of Messrs. Terrier and Co., of Suresnes, near Paris, (No. 3057), pre-eminently so.

Some Prussian dyers also showed delaines presenting features of superior excellence; but in *mixed* fabrics where the difficulties presented by the combination of animal and vegetable substances have to be overcome, there was nothing in the Exhibition equal to the colours and effects produced by the Bradford dyers. The black goods were particularly attractive to the scientific visitors of the Exhibition, and in colours it was manifest that the superiority of this district so noticeable in the Exhibition of 1851 was still kept up; indeed for all fabrics and colours in *ordinary* use, it may still be affirmed that our dyers can produce from goods made with white cotton warp and worsted weft, shades equal or very nearly equal in beauty and permanence to those produced by the foreign dyers from goods made entirely of wool.

Drawback.

Drawback.—The French worsted manufacturer is said to derive an advantage from the "prime" or bonus allowed by his Government upon the exportations of his yarns and goods, which must be taken into consideration in estimating the difficulties our manufacturers have to contend with in their competition, but upon close examination of the official tables given below, it appears that this advantage is more apparent than real. The deputation have reason to believe that the French manufacturer imports the greatest part of his wool for weft, even if he employs nothing but the home-grown article for warp. For these imports he is obliged to pay, if imported in French bottoms, an ad valorem duty of 20 per cent., which, upon the actual value of the manufactured article cannot amount to less than 5 or probably 6 per cent.

The drawbacks upon the great bulk of merinos exported to this country range from 5½ per cent. to 8½ per cent. upon their value; thus barely equalizing the disadvantage the French manufacturer labours under from the duty imposed upon the raw material which has become perfectly indispensable to his production; this duty must at the same time injure the manufacturer by its tending to raise artificially the price of the home-grown wools. The bonus allowed upon the exportation of yarns appears to be more consider-

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able than upon goods, without having given a stimulus to their being used by our manufacturers. The whole system of prohibition of manufactures, of import duties on raw materials, combined with a sliding scale of drawbacks for exports, is so much in favour of the smuggler and of the dishonest exporter, that it is no doubt doomed to immediate revision, if not to complete abolition, by the enlightened originator of the splendid Exhibition of which your deputation have had the privilege of studying and imperfectly describing a single but interesting department.

Conclusion.

In conclusion, the deputation desire the trade to remember that their province was only to examine and give a description of the various products exhibited in the Palais de l'Industrie, and a short account of the machinery which they inspected, pointing out where any improvements were apparent. It does not seem to be within their province to make any recommendations.

The Chamber and the trade have now before them an account of what the deputation examined and their impressions thereon, and they will indeed feel happy if their labours shall be found to be in the slightest degree useful to the trade of this district, either by having directed attention to new sources of supply of the raw material or to any improvement in the manner of working it.

SAML. BOTTOMLEY,
EDWD. WAUD,
J. W. CHILD.

JOHN DARLINGTON, Secretary.

QUESTIONS ASKED BY THE DEPUTATION AND THE ANSWERS GIVEN BY THE MINISTER OF AGRICULTURE, COMMERCE, AND PUBLIC WORKS.

Import duties in France.

1st Question put by the deputation:—What are the import duties upon wools imported from England or from other countries?

Answer:—Imported directly in French ships from countries beyond Cape Horn and the Cape of Good Hope:

				per kilogramme. f. c.
From Australia, the Cape, and Cape Town.	Raw			0 25
	Scoured or washed	cold	Entire fleeces	0 50
			Flock or waste	0 25
		hot	Entire fleeces	0 55
			Flock or waste	0 30
From other places	In the grease			0 10
	Washed cold		Entire fleeces	0 20
			Flock or waste	0 10
	Washed hot		Entire fleeces	0 20
			Flock or waste	0 15

Imported from other places :—

By sea—In French vessels, 20 per cent. of value.
In foreign vessels, 20 per cent. of value, and 3f. per 100 kilogrammes, gross weight.

By land—Wool grown in neighbouring countries, 20 per cent. ad val.
From other countries, 20 per cent. ad val., and 3f. per 100 kilogrammes, gross weight.

NOTE.—No other wool to be considered flock or waste, but such coming from the neck, the foot, and the tail.

Export duties in France.

2nd Question put by the deputation :—What are the duties paid upon the exportation of wool from France ?

Answer :—The export duty for wool or yarns, without distinction of destination, is 25c. per 100 kilogrammes.

The duty upon goods re-exported on their leaving the bonded warehouses is, 15c. per 100f. value, or 50c. per 100 kilogrammes, at the choice of the exporter.

These duties are paid only in case the goods are re-exported directly by sea, *i.e.*, from the same port where the entrepôt is situated.

The export duties are not demanded upon goods of which the prime has been paid.

Drawbacks.

3rd Question put by the deputation :—Has the French manufacturer any other advantages or facilities given by the Government?

Answer :—The following drawbacks are given for French yarns exported, if spun from pure wool and without admixture of waste or other base materials :—

		per 100 kilogrammes. f. c.
Scoured, and the wool from which it has been spun of the value per kilogramme, washed hot, exclusive of the duty paid	From 2f. to 4f. inclusive	75 00
	Above 4f. to 6f. „	125 00
	Above 6f. to 8f. „	175 00
	Above 8f. to 10f. „	225 00
	Above 10f.	275 00
From unscoured wool worth per kilogramme, washed hot, before payment of duty	From 2f. to 4f. inclusive	60 00
	Above 4f. to 6f. „	100 00
	Above 6f. to 8f. „	140 00
	Above 8f. to 10f. „	180 00
	Above 10f.	220 00
Mixed with floss silk :—		
Scoured, the wool employed being worth per kilogramme, washed hot, and before the payment of duty	From 2f. to 4f. inclusive	50 00
	Above 4f. to 6f. „	83 75
	Above 6f. to 8f. „	117 25
	Above 8f. to 10f. „	150 75
	Above 10f.	184 25
Not scoured, the wool employed being worth per kilogramme, washed hot, and before the payment of duty	From 2f. to 4f. inclusive	40 20
	Above 4f. to 6f. „	67 00
	Above 6f. to 8f. „	93 80
	Above 8f. to 10f. „	120 60
	Above 10	147 40

The same drawbacks are paid to woollen yarns mixed with other substances than floss silk, if the mixture contains above half wool The drawback is calculated according to the real quantity of wool it contains.

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"PRIME" OR BONUS UPON THE EXPORTATION OF MERINOS.

Of the value of less than 15f. per kilogramme, 85f. for 100 kilogrammes.

„	15 to 25 exclusive	. .	140	„
„	25 to 35 „	. .	195	„
„	35 to 45 „	. .	250	„
„	45 and more	. .	300	„

Report on Wool, Woollen Manufactures, and the Machinery employed in their Production, made to the Huddersfield Chamber of Commerce.

Huddersfield Chamber of Commerce.

On the 17th of August 1855, a special meeting of the Council was held to consider a circular letter received from the Secretary of the Board of Trade, at Paris. (See p. 107.)

Arrangements made to carry out the suggestion of the Board of Trade.

The subject of this letter was deemed of sufficient importance to deserve the immediate attention of the Council, and a correspondence was accordingly opened with other Chambers of Commerce in the neighbourhood, with a view to give it some practical effect. For the purpose of promoting the more immediate benefit of the manufacturing interests of this district, it was ultimately resolved to send Mr. Henry Lister, of Huddersfield, a gentleman of considerable experience in both manufactures and machinery, as a deputation from the Chamber, to visit the Exhibition, and make a full report of the machinery and goods exhibited there; also to visit some of the manufacturing towns on the Continent, with a view to obtain practical information regarding the whole manufacturing process now in use, and to make himself acquainted with any machinery employed, differing from that already adopted by the manufacturers of this neighbourhood. It was also arranged that the deputation from this Chamber should, so far as practicable, act in concert with the one from the Leeds Chamber of Commerce, who visited the Exhibition at the same time. Mr. Lister proceeded on his mission on the 5th of October, and, after his arrival in Paris, devoted twenty-four days to the examination of the various products comprised in the Exhibition, and from the report made to the Council, they are perfectly satisfied that every exertion was made by him to procure the information required, and carry out the objects contemplated by his appointment. Mr. Lister afterwards visited Verviers, the principal seat of the woollen manufacture in Belgium, Chaud-Fontaine, and other places in the neighbourhood; and from the details contained in the Appendix to this Report, it will be seen that much practical and useful information was derived from his visit to these places.

The subject of these inquiries and investigations is most naturally and conveniently divided into three heads or branches:—

I. Wool. II. Machinery. III. Manufactured goods.

HUDDERSFIELD CHAMBER OF COMMERCE.

I.—WOOL.

Wool.

The wools of France, Spain, Portugal, Germany, South America, Australia, Van Diemen's Land, and the Cape, were well represented in the Exhibition; but the peculiarities of all these wools are too well known to the manufacturers of this district to require any extended remarks.

Colonial wool.

It may, however, be worth while to observe, that if the growers in our own colonies could be induced to get up their wools in better condition the manufacturing interest generally would, as well as themselves, be greatly benefited thereby, and much trouble and expense would be saved in getting rid of burrs and seeds, which are very detrimental, and both of which might to a great extent be avoided, if sufficient pains were taken for that purpose. The soil, climate, and pasturage of Australia and Van Diemen's Land are evidently well adapted for the growth of every varety of clothing wools, and the Council have no doubt that our colonists will, with a proper application of their capital, and a right direction of their enterprise, be able to supply the manufacturers of this and other countries with raw material of suitable quality to any needful extent.

The Council are also glad to find that the Cape wools exhibited show a great and continued improvement.

German wools.

It is scarcely necessary to remark, that for the finer description of cloth the better class of German wools maintain their pre-eminence.

South American wools.

Amongst the lower class of wools the Peruvian appear to be superior to any other, for soundness, cleanness, and general adaptation for clothing purposes.

The care and attention of the South American growers should, however, be directed to some effectual means of avoiding the kempiness which is so detrimental to the quality and utility of their wools.

II.—MACHINERY.

Machinery.

With reference to machinery, the Council felt that they would not be discharging their duty to the Chamber without giving a full and accurate description of such machines as, in the opinion of Mr. Lister, showed any improvement in their construction, and not only of those seen in the Exhibition, but also of those at work in the different manufactories which Mr. Lister was kindly permitted to inspect.

The Council are well aware that some of the machines described in the Appendix have been tried in this country, and, on temporary failure, have been permitted to fall into disuse, but if the continental machine makers have suc-

ceeded in bringing the same machines into such a state of perfection as to enable the manufacturers to work them with obvious advantage, the Council think our own machinists only require to be informed of this fact, to induce them to apply their inventive faculties to the subject, and to persevere until they shall, at all events, have arrived at equally satisfactory results.

In their eagerness and willingness to adopt improvements, all due credit must be given to our continental competitors, but in inventive genius, and the application of mechanical skill, the Council hope they will never be called upon to concede to any nation permanent superiority over their own countrymen.

Want of ingenuity shown in the English machines.

With reference to our woollen machinery, it must be admitted that we have not hitherto brought into exercise, and sustained the same amount of mechanical ingenuity and skill which the cotton and worsted trades of this country have done. The Council trust, however, that our woollen manufacturers will not be indifferent to the subject, or unmindful of the rapid strides which are being made both abroad, and in other branches of our home manufactures, but laying aside any prejudices and predilections they hitherto may have held, will encourage that improvement in every branch of our productions, by which alone a general pre-eminence for them, both at home and abroad, can be secured and permanently maintained.

For an object so desirable, there is no doubt the machine makers connected with the woollen trade will lend their willing aid, and by the combined efforts of manufacturers and machinists, the Council have no doubt the English woollen manufacturers will continue to maintain the rank they have hitherto held amongst the manufacturers of the world.

Advantage of the easy terms on which the French can secure patent rights.

The Appendix to the Report states (so far as the Council have been able to ascertain) in which of the machines described patent right is claimed; and upon this subject we may remark that the easy terms upon which French people can secure patent rights for their inventions is a great incentive to the cultivation of mechanical genius, and greatly stimulates that thirst after scientific and artistic knowledge which is so peculiar to all classes of the French people.

III.—Manufactured Goods.

Manufactured goods.

In reporting upon manufactured goods, it has been thought advisable to give a statement of the number of exhibitors from the various manufacturing towns and vil-

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lages on the Continent, as affording a fair criterion of the degree of interest displayed by them, and showing the places where manufacturing operations are spreading, and where we may look for those who are to compete with us in the markets of the world.

Small number of British exhibitors.

It is to be regretted that a great number of the English woollen manufacturers did not avail themselves of the opportunities afforded by the Exhibition, as from the success obtained by those who exhibited, there is every reason to believe that the result would have been most satisfactory, and the Council are gratified to be able to report that one of the very few manufacturers, Messrs. I. and T. C. Wrigley, from Huddersfield, who exhibited obtained the prize of a first-class medal. (See Appendix.)

French exhibitors.

In manufactured goods the French are represented by 280 exhibitors from seventy-six places, besides Paris. They have made a great effort to attain a favourable position, and there is no doubt they have succeeded to a considerable extent.

The demand for woollen and worsted weft, and cotton warp gambroons (which we have partly lost sight of under the erroneous impression that they were no longer in request) is steadily increasing, but in consequence of our acting on this impression, the orders for them have found their way to Roubaix, and several other towns in France.

Taste shown in design and colouring.

The continental manufacturers have an aptitude for tasteful designs and colourings in fancy goods, which has the effect of giving them a great measure of success in competition with us, and in such a rivalry we can indulge no hope of distinction, unless our manufacturers will cultivate the same excellency in taste and design. In worsted warp and woollen weft trowserings, the French manufacturers exhibit excellent styles, and valuable cloths, for which there is an increasing demand. They also exhibit specimens of the dry clean-faced buckskins, of which we used to make such large quantities. They are well made in all wool, woollen warp and cotton weft, and cotton and wool mixed warp, with woollen weft, and of various fancy colours.

Seats of woollen cloth manufacture in France.

The chief seats of woollen cloth manufacture in France are Elbeuf, Sedan, Vienne (Isère), Calvados, and Louviers. Of shawls—Paris. Mixed fabrics—Roubaix, Tourcoing, Lyons, and Nîmes.

Prussian exhibitors.

PRUSSIA is represented in the woollen trade by 147 exhibitors from forty-seven towns. The Prussian manufacturers produce nearly all the same classes of goods as the French, and follow them closely in machinery, as well as make, finish, and colour. The buckskin trade is much cul-

tivated here. The plain, twilled, satin and zephyr cloths are very well got up. Their waistcoatings are excellent, both in expensive and low materials. Their robe de chambre cloth is well known. Cotton warp and woollen weft trowserings are made in large quantities, and the exports of these are considerable. HUDDERSFIELD CHAMBER OF COMMERCE.

Their beavers, moleskins, eiderdowns, and reversible coatings are very good. Army and navy cloths, pilots, serges, and billiard cloths are shown in great variety, of which further particulars are given in the Appendix.

BELGIUM is represented in the woollen trade by twenty-five exhibitors from six different towns. Liege and Verviers are the chief seats of manufactures of cloth, Brussels of shawls, waistcoatings, and other fancy goods. This country also adopts the same machinery, make, finish, and colour, as France. Their export trade is every year on the increase, and Mr. Lister inspected one mill near Verviers wholly employed in making sale yarns for Scotland. Belgian exhibitors.

AUSTRIA is represented in the woollen trade by eighty-nine exhibitors from twenty-one towns. The manufacturers of Brünn and Vienna are the greatest producers of plain, twilled, and satin cloths, woollen fancies, buckskins, yarns, army cloths, double milled cloths and coatings, in great variety and style; also good reversible coatings. At Vienna shawls and waistcoatings are made in every variety and material. The French manufacturers are closely imitated by the Austrians. Austrian exhibitors.

SWITZERLAND is represented by two exhibitors of cassinetts, buckskins, and woollen and cotton trimmings. (For particulars, see Appendix.) Swiss exhibitors.

WURTEMBURG is represented by eight exhibitors from eight different places, following closely on the French in every thing connected with manufactures. (See Appendix.) Wurtemburg.

SAXONY.—Sixteen exhibitors of woollens from nine places. Saxony.

NETHERLANDS.—Four exhibitors of woollen and cotton, and all wool goods. (See Appendix.) Netherlands.

BAVARIA.—One exhibitor of buckskins. (See Appendix.) Bavarian.

GRAND DUCHY OF HESSE.—One exhibitor of shoddy. See Appendix. Grand Duchy of Hesse.

GRAND DUCHY OF LUXEMBOURG.—One exhibitor of woollen cloth and fancy trowserings. Grand Duchy of Luxembourg.

In all these places the manufacturers are following the French in machinery, styles, and colours. *Le Journal des Modes* published in Paris every month, with full particulars Imitation of French style.

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of fabric, substance, colour, and design of the latest productions, finds its way all over the Continent; and the prevailing styles are known in the remotest town, nearly as soon as in Elbeuf and Sedan.

Continental export trade.

For some years the continental manufacturers have had an increasing trade with America and the Levant, supplying them with middle and fine qualities of plain twilled satins, zephyr and ladies' cloths, for which there is always a regular demand. After considering all the information obtained by Mr. Lister with reference to the goods made for export, and taking into consideration the country and the people for which they are intended, it appears that the reason for the success of the continental manufacturers in the above-named markets, is the especial pains they have taken to adapt their goods thereto, and that any loss which we have sustained thereby, is not attributable to our inability to compete with our continental neighbours, but to the absence of well-sustained efforts to produce a style of goods suitable for those markets, and to the fact that the attention of our manufacturers is principally confined to the manufacture of goods adapted for the home trade, which are quite a different class from those suited to the markets just mentioned.

Portugal.

PORTUGAL.—Five exhibitors of cloth and cassimeres and heavy low goods from three places. See Appendix.

Sweden.

SWEDEN.—Nine exhibitors of woollen goods from four places. See Appendix.

Norway.

NORWAY.—Five exhibitors of woollen goods from five places.

Great Britain.

ENGLAND.—Eleven exhibitors of woollen goods from Leeds; four from Huddersfield; six from London; four from Trowbridge; eight from Leicester, Norwich, Kendal, Dewsbury, Wilts, Chipping Norton, and Wakefield.

Scotland.

SCOTLAND.—Glasgow is represented in woollens by seven exhibitors; Hawick, three; Paisley, two; and Selkirk, two.

Detailed particulars of the goods exhibited and comprised in the above summary will be found in the Appendix, and all the patterns which Mr. Lister was able to obtain, with the prices marked, may be inspected on application to the attendant at the Reading-room of the Chamber.

Dyeing.

With reference to dyeing, Mr. Lister was unable to obtain any positive or practical information, which would be of service to our manufacturers.

Weaving and industrial schools.

Upon the subject of the education of workpeople, it is worthy of remark, that on the Continent great advantages are derived from weaving and industrial schools, such as

are established at Elberfeld, Mülheim, and other places, where young men of all classes are taught designing and its practical application at the loom—chemistry and its application to all branches of manufacture, and go through a regular course of training for the manufacturing business generally. Such schools have proved of the greatest service to both masters and workmen; and the council urge the merchants and manufacturers of the West Riding to consider whether such an establishment in a central position of the woollen district would not lead to advantageous results.

General considerations.

After carefully reviewing the whole subject, and weighing with impartiality and candour the information which has been obtained, the Council have no reason to fear but that British capital, industry and enterprise may still maintain for us the pre-eminence which we have hitherto enjoyed for producing goods adapted to the varied wants of the world. At the same time there is ample proof afforded that the nations of the Continent are quite alive to the importance of encouraging manufacturing industry in all its branches, and that they immediately avail themselves of every improvement in machinery, either in use amongst us, or invented by themselves, for cheapening their productions. The disparity which existed between these nations and ourselves some thirty years ago is, it must be admitted, now considerably lessened, and our present most important advantage over them, in the transit of raw material to the manufacturers, and manufactured goods to the various markets, is daily becoming less appreciable by the increase of continental railway communication, and the extension of their commercial shipping. The Council wish, therefore, to impress upon our manufacturers the absolute necessity of making every effort, and putting forth their best energies to meet the growing competition which is thus offered to them, and not allow themselves to be lulled into a state of inactivity or false security by any mistaken ideas of their own inherent superiority.

Successful competition of the continental manufacturers.

It cannot be denied that the continental manfacturers now successfully compete with us in several neutral markets, which until recently were almost wholly supplied by us. This may, to some extent, be attributed to our ever increasing home trade, and to the preference which may be felt for producing goods adapted thereto; but the Council do not think the engrossing claims of this market are either so obvious or urgent as to lead us to underrate the policy or advantages of studying the wants of the best foreign markets, not only with a view to maintain the ground we have already acquired, but for further progress in that direction.

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The Council have great pleasure in acknowledging the kind assistance afforded to Mr. Lister by Captain Fowke, R.E.; the Rev. F. Greeves, Paris; and Frederick Schwann, Esq., Huddersfield, at Paris; and by those continental machine-makers and manufacturers who so kindly allowed Mr. Lister facilities for procuring the information he has laid before the Council.

JOHN BROOKE, *President.*

21*st January* 1856.

APPENDIX.

MACHINERY.

WOOL SCOURING.

Machine for wool scouring.

THERE were no wool-scouring or wool-washing machines in the Exhibition. M. Fagard, of Chaud-Fontaine, near Verviers, allowed Mr. Lister to inspect the wool-scouring process used in his mill. The apparatus consists of two cisterns, built of strong wood, and lined throughout with zinc; the size being generally 5 feet deep, 9 feet long, and 4½ feet wide. On one side, midway, is fixed a small water-wheel, having arms 18 inches wide, with 18 inches dip, and without rim. The axle is fixed through the side of the cistern, and turned at a smart speed by power.

The scour is prepared with urine and salts in the usual way in this neighbourhood. The wool is immersed and the wheel set in motion, driving scouring liquor and wool rapidly round.

By this simple contrivance the wool is never at rest, every lock is thoroughly cleaned and opened, and not in the slightest degree milled.

After the wool is sufficiently scoured, it is lifted out by young women, with long stangs, the wheel still going round and bringing all the wool forwards to the place where it is taken out. It is then placed in an open carriage and allowed to drain before being put into the washing-off cistern, which is in every respect like the scouring cistern.

Two strong women scour from 2,000 to 2,500 lbs. of wool per day, working about ten hours.

The drying is done over the boiler, or out of doors in fine weather, in the same manner as here.

By the above process, which is being generally adopted in Belgium, the wool is scoured cleaner and is more opened in considerably less time than by our present system. There is also more of the natural loftiness of the wool retained than when it is simmered for a length of time without being kept in motion.

The mode of taking out the wool from the vat is less expeditious than the plan in use here.

WOOL TEAZING AND MOITING.

Machine for teazing and moiting.

There were no teazers exhibited surpassing those in use in this country.

Those shown were of various constructions, but generally occupying a great deal of room and doing less work, without being in any respect more effective than our own.

Sykes and Ogden, of Huddersfield, exhibited their machine for moiting or cleaning wool, for which they obtained a first-class medal. There appears to be nothing superior to it, nor one that contained any new principle worth detailing.

This machine was very highly spoken of by continental manufacturers.

SCRIBBLING, CARDING, AND SPINNING.

Spinning mule.

Bracegirdle and Son, Brünn, exhibit a condenser and spinning mule. (Austria, Class 7, No. 298.) The condenser is 33 inches on the wire, and working sixteen hours a day, turns off from 2 to 3 cwt. of slubbing per week, according to the quality of yarn required. It has one back doffer clothed with rings, made in some instances with patent elastic leather of various widths, according to the thickness

of slubbing required. The rings are easily changed by slipping them off the end of the cylinder, three-sixteenths of an inch space, clear from the wire, between the rings, being sufficient to divide the slubbing. The doffing stock is set with full length plates. The slubbing rollers are worked with double eccentrics. The bobbin is run in fixed sockets, the rack traversing. The feeder is of the usual construction, and the wool is laid on in the blanket or sheet as it is stripped from a wood drum attached to the scribbler. Two or three of the workers have traversing motions, to spread the wool equally on the swift.

This condenser was not exhibited in work, so that no decided opinion could be formed of its capabilities. It can be easily adapted for coarse or fine wools, by changing the rings; but, on the whole, the machine is not superior to a few already in work in this neighbourhood. In feeding, our plan is superior to the one adopted in this condenser, and our machines also turn off more work.

The spinning mule has 240 spindles, with gearing at the back of carriage. The strap pulley is placed in a contrary position to the pulley on the shafting. The speed wheel and pinion wheels, with taking-up roller, are worked with the flat sides close to the floor and turned from an upright shaft connected with the strap pulley. The spindles are banded in groups and turned from upright wood rollers, fixed within the carriage in the way that hand jennies used to be banded.

The giving out rollers are made quite smooth, without axles, the ends are close together, without pinions, and rest upon two under-rollers; the front being worked by giving out gear and the back turned by means of small cogwheels from the end of the front rollers, but at less speed, thereby drawing out the slubbing considerably. Upon this mule very even yarn is spun at once over to from forty to fifty skeins, out of from twelve to fourteen skeins slubbing.

This mule is not upon the whole equal to those of the best construction in this neighbourhood, but it possesses the advantage of spinning yarn to a greater length at once over, by means of the double set of drawing rollers.

A. Mercier, of Louviers (*Eure*), (France, supplement, Class 7, No. 9933,) exhibits teazer, scribbler, baller, condenser, one mule for sliver, and two mules for spinning, all in work. Machine for scribbling, &c.

The teazer is about a quarter the size of our ordinary machines, with cylinder and teeth proportionately less and closer set.

The wool is opened and cleaned by being put through twice. It is then run through the first scribbler, after which it is laid on to the baller, doffed in two equal parts, and taken through two separate tweazlers, then brought together, run through one tweazler, and between iron rollers, on to the balling bobbin.

The sliver is run direct from the balls into the condenser by means of an upright creel, with wood rollers, just long enough to fit inside the flanges of the bobbins, and placed horizontally with the axles in fixed sockets, or slots, and turned by small cogwheels from an upright iron rod, which runs up the side of the creel. This rod is turned from the end of a horizontal rod connected with the feeding rollers, by which it is also regulated in speed. The balls are placed upon the wood roller with the surface of the roving resting thereon, the axles running in the same slots. By this means the rollers are all turned at one speed and give off the same length of roving from every ball without regard to the quantity upon the ball.

The condenser has one swift, the usual number of workers, strippers, and fancies, with two back doffers, clothed with rings, about one inch in width, and the same distance apart, one taking what the other leaves.

There is one set of rollers and one bobbin to take the slubbing from each doffer. The slubbing rollers are worked with double eccentrics; one or two of the workers have traversing motions, to spread the wool on the swift.

The mules are of the ordinary construction, with creels to hold only condensing bobbins, and when they have roved a set, they have to wind the roving off the cops on to the condensing bobbins, to be again placed in another pair of mules, and spun to the desired number.

There appears to be nothing in this set of machines requiring particular notice except the creel for the balling bobbins. The creel is of very ingenious construction, and regulates the tension of the roving with the greatest nicety. The general adoption of this plan to our own condensers would be of great service and advantage.

Throughout the continental manufactories there is a regular uniformity in the size of doffing cylinders, by which loss of time and irregularities in the ordering and fitting of cards are avoided.

The cylinders are usually formed of iron or plaster of Paris, which are not so likely to be affected by atmospheric changes and other derangements as wooden ones.

The condensers are universally adopted in France, Austria, Prussia, and Belgium. The slubbing billy is not known.

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Spinning mule.

Leopold Muller & Son, Than, Haut-Rhin, (France, supplement, Class 7, No. 9986,) exhibit one small spinning mule, applicable for wool, cotton, or flax; it was only seen spinning woollen yarn, a sample of which was furnished (see sample No. 1). The slubbing is brought from the condenser and placed in the creel, as with an ordinary mule, the ends are drawn through moveable lead bobbins (which are placed on the top of the back wood rail opposite the slubbing bobbins) and then passed through three sets of rollers, the two first sets being made exactly like our giving out rollers, leaving a space of four inches between each row, the second set running considerably quicker than the first, and the third quicker than the second; the thread is then attached to the spindles, drawn and spun in the ordinary way.

The rollers give out slubbing all the time the carriage is going out. The spindles are turned by bevil wheels instead of bands and roller. Upon this mule the yarn is spun at once over, out of ordinary slubbing, to any skeins it is possible the quality of wool will allow (see samples No. 2). In order to keep the spindle down in the steps, there are wire springs wrapped securely round the spindle, between the small bevil wheel and the loop, allowing the spindle to be lifted up with a little pressure, but keeping it down in the step when working.

The attention of manufacturers is directed to the principle adopted in this machine, of drawing out the slubbing by means of two and three sets of rollers, whereby a thread can be spun to double the number of skeins at once over as can be obtained by the ordinary mule, and the yarn is more even, and the threads not so likely to come down.

Spinning frame of novel construction.

A. D. Ronnet, Pont Maugis, Ardennes, (France, Class 7, sec. 4, No. 1552a,) exhibits a woollen spinning frame of a very novel construction. The frame, in form, is very like the winding frame for silk; the slubbing is prepared by the condenser in the usual manner, on large tin bobbins, which are placed in two rows down the middle, and on the highest part of the machine. The thread of slubbing is then passed through a guide, in the centre of a circular piece of iron about three inches in diameter. These circles are fitted into sockets made in the iron frame, and are turned round on their own axis, giving the slubbing a slight twist; from this guide it is passed through a set of common giving-out rollers, over a space of four inches, and through another set of rollers similar to the first, but going at a greater speed, thereby drawing out the slubbing; from this point it goes through the fly (which is of the ordinary construction) to the yarn bobbin, which in this case is rather larger than a silk bun, and of the same shape. Between the fly and the last set of rollers there is an iron blade which is placed under the threads, and works upwards, coming slightly in contact with the yarn; this appears to be for the purpose of still more distending and clearing the thread as it goes along.

The yarn can be made to wind on to cops or spools.

Upon this principle of continual spinning, the time in drawing out and extra room taken up by the ordinary spinning mules are avoided. The system is also admirably adapted for doubling of any description, the twist being produced without the irregularity and shadiness ordinarily produced by the usual mode of doubling.

The attention of woollen manufacturers is directed to this machine, which appears to possess considerable advantages over the spinning mule in ordinary use.

WARPING, SIZING, DRYING, AND BEAMING.

Machine for warping, &c.

At L. Peltzer and Co.'s manufactory, at Verviers, is a machine for warping, sizing, drying, and beaming, in one process.

The frame stands about two feet from the floor, and is six feet long by three feet broad; at the beginning end is fixed a good, firmly-made reed, lengthwise across the entrance, through which the ends are brought from off the bobbins in the creel.

The creel stands before the slay, and is made to hold twelve large tin bobbins in a double row, six down each side; every bobbin contains fifty ends or threads: over each bobbin is a piece of wood, one end resting upon the yarn, and the other in a pivot, the weight of which keeps the bobbins from overrunning; the warp is brought through the slay, one end per dent, taken over a small roller placed upon the outer edge of the size-trough, under a thicker roller, which runs up to the axle inside the trough, thereby immersing it. It is then brought back over the same roller, on the top of which runs another of the same size, with axles in the same open slots, and by its weight upon the warp presses out the superfluous liquid. The warp is again brought back over the top roller, continued to the

other, or latter end of the frame, over a small wood roller, and immediately and under the drying cylinder, which is hollow and made of copper, about 18 inches in diameter, by three feet long, and heated with steam, introduced through the hollow axle. The warp is brought completely round to the point at which it first came in contact with the cylinder; it is then brought off under another small wood roller, placed directly over the one it passed in going under the cylinder, conveyed midway under a skeleton cylinder (with longitudinal wires placed one inch apart), over the same, and back to the latter end, through another reed like the first, placed directly over the drying cylinder, then continued forwards to another reed 12 inches wide, with every alternate dent soldered up with lead, one-third of the space from balk to balk, leaving one-third open midway. Each dent contains one thread. The warp being pressed towards the bottom balk, every alternate thread, which is in the open dents, sinks to the bottom, leaving every other midway; when one-half the leese is taken, by pressing the warp towards the top balk, the threads in the open dents rise to the top, leaving the rest midway, thereby getting the other half of the leese.

The leese being taken, the ends of the 600 threads are made fast to a horizontal mill, three yards in circumference, with supports for the ends of the axle,—the feet of the supports running upon slides laid upon the floor. The mill is then turned by straps from the shafting, and winds on the warp quite dry, round upon round, for any length of warp required, when the leese is again taken, and the 600 threads are again wound on close to the first 600, and so on for the number of threads required. The foot end is outermost when the warp is finished; it is then secured to the warp beam and wound on without requiring a raddle, and with the greatest rapidity, it being the width required for the beam when wound on the mill. There is a small apparatus separate from the rest of the machine to wind the bobbins off cops; this is tended by a girl, who places fresh sets of cops in the winding creel as the others run off. The bobbin is fitted into a frame with two ends like the ends of a common warping creel, and is turned by pressure from a wood roller, with axles running in the same open slots as the axles of the bobbins. There is also a small crank attached to the axle of the roller, which works an apparatus for measuring the length of yarn on each bobbin, and can be set to ring a small bell at the end of any length of yarn required.

By this method of warping and sizing, the warp comes off the machine in beautiful condition; every thread is of equal tension, in its proper place, and quite open and separate. Warps loomed by this system give the weaver little trouble, and there is less danger of imperfection and breakages than with those prepared according to the old mode.

CARD GRINDING.

Rollers for grinding cards.

L. Fourcroy, Rouen (France, Supplement, class 7, No. 1657), exhibits emery rollers, for grinding woollen cards, of various constructions. They are generally made to run in an iron frame, and turned by power; the frame is made to receive the workers, or any other part of the scribbling cylinders, which can be fixed to any pitch for grinding, and left alone for a considerable time without tending.

Dubus Aîné, Rouen (France, Supplement, class 7, No. 1654), exhibits rollers similar to the above, with one of different construction, being made with iron frame, as before, and large emery pulleys, to work from side to side upon traversing axles.

Moriceau, Meilame, Mouy, Oise, France, exhibit a great variety of grinding machines, slightly differing from the above in minor points, but all worked by power on the same principle.

These machines are similar to those in use in the more improved manufactories in this country, with some deviations in the mechanical contrivances, not requiring particular enumeration.

POWER LOOMS.

Power looms.

Wm. Todd and Co., Heywood, near Manchester, exhibit an improved power loom. (For full particulars and plan see duplicate.)

The yarn beam is within the loom and weighted by pressure. The warp rest gives in by spring and crank, to ease the tension in opening of shed; the tappets are well arranged, and the healds are worked by rack quadrant and pinion.

The lathe is fitted with weft feelers, to stop the loom when the weft is broken or finished, and also escape motion, by which, if the shuttle is by any accident stopped in the shed, the slay is thrown out of the bottom slot, and the lathe comes to in the usual way without breaking any of the warp.

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The picking swords are worked from underneath, the top end with the socket comes up through the shuttle box, and receives and propels the shuttle with the greatest precision and rapidity, rendering check straps and picker spindles unnecessary.

Power looms.

If the warp is required to be let slack, in consequence of any wrong shoots of weft, or other defects, it is done by a lever within the reach of the weaver, and is tightened up with little trouble.

This is the most complete loom exhibited, and can be adapted to woollen weaving, without losing any of its qualifications. Its advantages are, simplicity of construction, increased speed, economy of space, power, wear and tear.

It is not an entire new invention, but a combination of three several patented inventions, making altogether a perfect machine, and well worthy of the attention of manufacturers.

It can be made of any width and strength, so as to suit every class of goods.

Wm. Smith and Brothers, Heywood, exhibit two power looms, with and without rising boxes, both of good construction. The rising boxes are worked upon a very similar principle to those made by Schofield, Kirk, and Marshall, of this town; they can also be fitted up with Jacquard machines, tied up with harness from 200 to 400 wires.

It is surprising that these Jacquards, worked by power, have not come into use with our waistcoating and fancy woollen manufacturers. The Lancashire quilted waistcoating and cotton pantaloon manufacturers work all their looms by power with advantage.

M. Bornéque, Belfort, exhibits very useful narrow power looms, with rising boxes of very simple construction, rather light in make, but handy and firm, at reasonable prices, and well calculated for fancy trowserings.

They will work from one to three boxes to the Jacquard machine to any pattern; the boxes can also be fitted and made to work to nearly any old power looms.

Jac. Grassmayer, Tyrol, exhibits a very complete and handy power loom, with three rising boxes on one side, worked with cranks and spindles, and with short wood lags of strong compact construction for raising the boxes to any pattern.

These looms can be made for narrow trowserings at a reasonable cost, and they would also answer for waistcoatings.

POWER LOOMS AND JACQUARD MACHINES (DOUBLE-LIFT).

Jacquard machines.

E. Lecroix and Sons, Rouen, exhibit a Jacquard machine, 400 wires with double lift, (shedding equally from the centre,) by means of necks made of vulcanized india-rubber, made fast to a cumber board, which is placed where the weights usually are; the india-rubber extends from this board to the mails, and from mails to engine, with harness and necks in the usual way.

There are two grates; one rises with the engine and wires, that are not struck off with the cross-wires; the other lowers by the spindles, with the wires left off the rising grate, and are drawn down by the india-rubber necks at the bottom.

The engine, both inside and out, lifts clean up from the gantry; in the lift the engine and grate rise, the other grate lowers; in dropping, the lower grate rises and meets the engine and the rising grate.

This does well for light goods, making a very clean shed with equal tension of top and bottom warps; but for heavy goods, or for working in a room at a warm temperature, its utility is questionable.

Jacquard machine and power loom.

John Crossley, Newton Moor, Hyde, near Chester, exhibits a Jacquard machine with double lift, working upon Todd's power loom. This double-lift loom is the most practical of any exhibited. Upon this principle the double-lift movement is accomplished by two grates, one to lift and the other to settle. The cross-bars of the grates, when at rest, fit nearly close within each other, allowing the hooks to reach over both; and when the cross-wires come in contact with the cylinder, and opposite the perforations in the cards, the upright wires remain upon the lift grate; but where the card is not perforated the wires are thrown back upon the falling grate, the neck board settling along with it, thus causing the bottom warp to lower as much from the centre of the shed as the top warp lifts, causing equal tension, and thereby supplying the great desideratum hitherto wanting in Jacquard weaving, especially in woollen, worsted, or any other tender soft warps. The weights and harness are applied as in ordinary machines.

Electric Jacquard machine.

C. F. E. Midy St. Quentin, Aisne, (France, Cl. 7, Sec. 7, No. 1598), exhibits the electric Jacquard machine. The battery, with a coil of copper wires, is placed above the engine; the coil contains as many wires as the engine; that is, suppose the number of wires in the engine to be 200, it will require 200 copper wires round the coil; each copper wire is covered with green woollen, and connected with 200 separate magnets, placed in a board directly over the upright wires in the engine; the cross-wires have one end placed in the spring-box, and the other comes in contact with the card cylinder, which is made of copper; the design or figure is punched with holes, or painted on the design paper with metallic liquid, which must be a conductor of electricity; the bars of the top grate are placed in the contrary direction to those now worked in the ordinary engine. For every lift the whole of the cross-wires are sent towards the card cylinder by means of the spring-box, and where the paper is not perforated the electric current is cut off, and the magnets placed over the upright wires become non-conductors, and allow the hooks to remain upon the lift grate, and be thereby raised with the lift, producing the top shed; but where the design paper is punched out or covered with metallic liquid, the cross-wires come in contact, the current remaining complete, and the upright wire is drawn off the lift grate by the attraction of the top batteries or magnets; the wires thus left down form the bottom shed, and produce the desired pattern; both edges of the design paper are punched to fit upon the pivot points placed round each end of the card cylinder, which is invariably made circular.

By this method, any number of looms, having the galvanic wires continued from one to the other over the tops of the engine, and coiled round the top magnets of each, weave the same pattern from one design paper; but of course if one loom stops for the weaver to take up ends, or charge the shuttle with weft, the rest will be obliged to stop at the same time, showing its impracticability for general use in its present state.

The application of electricity to the printing of textile fabrics on exactly the same principle is being tried on the Continent, in numerous combinations of colours and designs, and with some degree of success.

HAND LOOMS.

Hand looms.

Blanquet and Sons (France, class 7, sec. 7, No. 15781), exhibit a very handy lathe with boxes at each end suitable for waistcoatings or dresses; the boxes are worked in a cylindrical form, the axle being placed where we have our spindle; the boxes are four in number, fixed round the axle, and turned by brass cog-wheels. (See further particulars and plan.) This lathe works with the greatest precision and occupies little room.

They also exhibit one loom for large shuttles with boxes placed down each side on a horizontal plane, and worked backwards and forwards upon slides like one large box with divisions, each shuttle occupying one; the lathe swings independently of the box and shuttles, the two not being in any way connected. In working, the lathe is put back to a certain distance, when it comes in contact with a piece of wood, placed for the purpose of steadying it, while the shuttle is sent across the warp. The boxes are moved by means of cords attached to the treddles.

This system answers remarkably well for large heavy shuttles, as it entirely relieves the weaver from the heavy and laborious work of swinging them backwards and forwards.

MILLING.

Milling machines.

Henry Desplas, Elbeuf, (France, class 7, sec. 9, No. 1628,) exhibits patent milling machines of a useful construction, which are chiefly used for goods which require a great deal of milling, such as plain cloths, doeskins, beavers, devons, and thick cassimeres of double and single widths. For quickness and regularity of width and length they are far preferable to the fallers. Mr. Lister saw four of them in full work at Verviers; they were placed with space between sufficient for the strap pulleys and levers to throw them in and out of motion. They are completely encased with wood, leaving the front and back to open with small doors; the pieces are secured end to end when put in, and are not taken off the rollers until finished, but are taken out as far as the rollers will allow, for the purpose of being measured in length and breadth, every ten or fifteen minutes. (See plan and particulars.)

These machines take very little room compared with the space required for the fallers and tappit wheels, besides being able to do considerably more work with fewer hands and less risk of weakening the colours.

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These machines are superior to the fallers generally in use in this neighbourhood for goods of sound quality and requiring a good deal of milling. For goods that require little milling the manufacturers on the Continent generally use the old fallers.

Houget and Teston, Verviers, (Belgium, class 7, sec. 4, No. 188,) are makers of milling machines similar to Desplas, some of which Mr. Lister saw in work at Verviers, and which appeared to give every satisfaction both to the proprietors and workmen.

RAISING.

Patent gig mill.

Ernest Gessner, Aûe neur Schneeberg, (Saxony, class 7, sec. 9, No. 10,) exhibits a patent gig mill of a very superior construction, occupying less room, doing considerably more work, with less attention and fewer hands than our gig mill. (See prospectus and testimonials from thirteen manufacturers of Germany, Belgium, and Austria.)

This machine can be made for small mills with only one teazle cylinder, and for large mills with two teazle cylinders. Upon each cylinder the cloth can be brought in contact, simultaneously, with the teazles two or three times; the contacts can be longer or shorter, keener or easier, and will raise the nap from either end without changing the position of the piece. All the rollers are made to give and take at one speed, keeping the piece of the same tension all the way through. At each end of the machine is a roller for distending the cloth from the centre to the lists, keeping the piece perfectly straight, and rendering the constant attention of the work-people unnecessary. The cylinders are made to receive the old teazle rods.

M. Gessner states, that with one of his double gig mills, and the attention of one workman, fives times as much work can be done as by an old gig mill with two workmen, or as much as five old machines and ten workmen will produce. The manufacturers who have signed the testimonials are not quite so sanguine as the maker; but this machine is, without doubt, very superior to those of the old construction, and the attention of our manufacturers is directed to it.

Raising machines.

Beck. Deparrois, Elbeuf, (France, class 7, No. 1627,) exhibits a raising machine, answering the purposes of our tiger. It is made on the same principle as Gessner's gig-mill, with one raising cylinder. The cloth can be brought into contact with the teazles two or three times simultaneously; the pressure of the contacts is equally regulated, and the distending roller is also applied very efficiently. The cylinder in this case was clothed with one board of the patent brass-wired cards alternately with one rod of teazles.

Machine for raising and cutting.

Houget and Teston, Verviers, (Belgium, class 7, sec. 4, No. 188,) exhibit a machine for raising and cutting in one process. The raising cylinder is placed at one end, and is clothed with teazle rods, and the cutting cylinder works at the other end, in the same manner as a perpetual; an endless creeper works underneath, and conveys the piece from the knife to the raising cylinder. The goods are worked wet.

This machine is found to be of great service in finishing a variety of fancy woollen goods, such as low hairlines, fancy doeskins, &c., but does not answer for better or finer qualities.

Metallic teazels.

D'Argence, Rouen, (France, class 7, supplement No. 9940,) exhibits samples of what he calls metallic teazles, cards set with long cut brass wire of various sizes, according to the quality of cloth for which they are required. (For particulars, see Prospectus.)

These are at present in use in Yorkshire, and are found to answer for some classes of fancy goods. Where they suit the work, there is an advantage in their durability, and a saving of time and expense in setting teazle rods. The samples exhibited were of first-rate workmanship, and appeared to be well adapted for the work, and likely to supersede teazles to a certain extent.

CUTTING.

Cutting machines.

Leopold Gruyer, Elbeuf, (France, class 7, sec. 9, No. 1633,) exhibits a narrow cross-cut machine, very complete in every particular. It is made on the principle of those in use in this neighbourhood, except that it has an iron habiting apparatus, in the place of leather and board. This apparatus consists of an iron plate, in the place of the board, five inches wide and a quarter of an inch thick, with upright points (about nine in twelve inches) firmly inserted, and standing perpendicularly half an inch upon the plate. Upon this plate is another exactly

the same size, and fixed to it with hinges. The upper plate is rather thinner and lighter than the lower one, with holes pierced to correspond with the points of the latter. When the list of the piece is pulled tight from the first point, and secured to the last, the upper plate or lid is shut down, and drives the whole of that length of list perfectly straight upon the points, and keeps it in that position until the knife has passed over. The list can be slipped off the points when the upper plate is lifted up. The opposite side of the machine is made in the same manner.

This method of habiting prevents slack and tight places, which often occur in using leather habits and hooks, the consequence of which is unevenness of nap within two or three inches from the lists.

Houget and Teston, Verviers, (Belgium, class 7,) exhibit an excellent broad perpetual, with the setting-up brushes, taking-in rollers, &c. well placed. The apparatus for setting the cylinder and blades to any pitch, acts with the greatest nicety and firmness, without the possibility of one side cutting closer than the other. The mechanism is complete in every part, with little complication. The machine is so perfectly arranged, than an inexperienced person can work it with the same accuracy and less trouble than a first-rate workman would work one of the ordinary machines.

Newman and Esser, Aix-la-Chapelle, (Prussia, class 7, sec. 94, No. 274a,) exhibit a broad perpetual, peculiar for its improved mechanism for setting the blade and cylinder, by means of which they can be instantly regulated or placed at any desired pitch, with certainty. The rollers and setting-up brushes are well constructed, and the machine altogether appears well adapted for accomplishing its work satisfactorily.

J. B. Verkin, Aix-la-Chapelle, (Prussia, class 7, sec. 4, No. 271,) exhibits a cross-cut machine and a perpetual, of very superior workmanship. The same system of habits is adopted in the cross-cut machine, and very similar setting apparatus in both machines, as L. Gruyer and Houget and Teston use in their machines, previously explained.

H. Thomas, Berlin, (Prussia, class 7, sec. 4, No. 273,) exhibits a broad perpetual, with very complete mechanism, yet simple and well arranged in detail.

The continental manufacturers appear to be turning their attention to the most approved modes of habiting and setting, so as to leave little or nothing to the care and attention of the workmen attending to the machine.

DRESSING.

Dressing machine.

David Labbez and Co., Sains Ousne, exhibit a very novel machine for dressing light thin goods. The frame is very much in the form of a narrow cross-cut machine. About 12 inches from each end is an apparatus in the shape of a lathe or going-part of a loom; the extreme end of the swords resting upon pivots in the floor, and the shuttle race standing two or three inches higher than the upper sides of the frame. From one end to the other of the shuttle race are laid two rows of iron plates, exactly like doffing-plates, except that the teeth are cut considerably finer, with the sides left sharp and rough. These plates are laid down nearly flat, and secured firmly to the shuttle board, with the toothed edges of both rows almost in contact and a little elevated. Parallel to this lathe, and within four inches of each side, are fixed two wood rails, the ends resting upon the upper edges of the side of the frame, and so arranged as to allow them to be elevated or lowered at pleasure by means of screws. About the middle of the frame, the piece is wound on to a beam, then brought up, and over the two rails and lathe, afterwards down and back under the rails, lathe, and piece beam, again brought up, and taken in the contrary direction from which it started, and over the two rails and lathe to the other end of the frame, and thence on to the finished beam. Both the lathes are worked with one crank, from one strap pulley, the shuttle board with plates rocking backwards and forwards as in a loom, at a very quick rate, traversing about six inches in both directions at each stroke. Rollers are fixed for taking and keeping the piece at a proper tension. By this simple contrivance, the piece is well dressed on both sides at the same time, one side being done in going in one direction over the first lathe, and the other in the contrary direction over the other lathe; the long wool, knots, shives, and burs are brought off in a continuous flake, like the wool from the doffer of a scribbler. Goods finished by this machine can be brought to as clear a face, at one through, as we find it safe to accomplish with knives at three or four throughs. A softer handle on the face is also obtained, the friction on the plates tending to wear the points of the hair to a fine soft full face, and however rough and un-

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even the piece is, it is impossible to make holes in it. The hardest knots are taken off without any danger to the cloth, and theflocks are also in better condition for being worked up again.

This machine is very suitable for tweeds, Leeds cloakings, woollen shawls, merinos, cassinetts, and a great variety of other woollen fabrics, but not adapted for fine faced cloths.

PRESSING, BOILING, DECATIERING, &c.

Pressing, &c.

There was nothing in the pressing department, either in the Exhibition, or in the manufactories inspected by Mr. Lister, particularly new or sufficiently different from our mode to be worth noticing. The continental manufacturers are very particular in having their goods well brushed, before putting into the press. The plans adopted by us of hollow plates charged with steam, and common plates heated in a steam oven or by fire, are practised on the Continent with nearly the same results as in this country. Boiling in water is never practised, as it takes longer time, employs more hands, does not give the desired results, and puts the colour to a more severe test.

In Verviers, Mr. Lister inspected a decatiering machine in work. It occupies about the same space as one of our common four-pillared presses, and is fitted with shallow receiving box for the steam, fixed firmly underneath a large copper plate pierced with holes and similar to a press bottom. This plate stands about fifteen inches from the floor. A piece of thick felt cloth is first laid upon the plate to receive any condensed steam, the cloth is cuttled in long cuttle upon the felt, and another felt is laid on to finish with ; the top is then screwed or pressed down with hydraulic pressure, steam pipes are placed in regular order round the receiving box under the copper plate, and turned on all at once, so that the steam will be quite evenly spread, and of equal force over the space occupied by the piece.

This process is well adapted for goods made entirely of wool, as it produces a better lustre on the face than the system of roll boiling and roasting in use in this country.

The decatiering process is generally adopted in France, Belgium, Holland, and Austria, with universal success. Its great advantage is, that the manufacturer can by means of it put any amount of lustre on the piece without materially injuring the soundness of texture. The reason the process has not answered when tried in this country, has probably arisen from the steam not having been applied at a sufficiently high pressure. When it is used by the continental manufacturers they apply from 30 to 40 lbs. to the square inch, allowing the piece to be from two to three minutes under operation. The steam at this pressure is in such a high state of rarefaction, that when the piece is taken from the machine, and instantly thrown open to the action of the air, it is perfectly dry. It is then brushed and steamed to the desired handle. Cloth made from yarn worked upon the condenser is best adapted to undergo the severe pressure of steam applied in this process.

CUTTLING AND MEASURING.

Machine for cuttling and measuring.

Chaplin Aîné, Rouen, exhibits a machine for cuttling and measuring pieces. The machanism is simple but very effective, accomplishing its work with expedition and the greatest nicety. The scray for the piece is placed at one end of the machine on the floor. The piece is brought over a roller with a moveable flange at each end, to keep the lists straight. A board rather broader and longer than the length and breadth of cuttle required is suspended from each corner with a cord, which is taken up and over each end of two rollers, placed over the suspending board. Over this board, and under the two rollers, is placed a traversing wood slot, long enough to receive the width of the piece, the end of which is taken through, and secured to the end of the suspension board, The traversing rack then moves from end to end, turning half round on its own axis, leaving the cuttle edge at each end equal with those preceding. At the moment the rack arrives at its destination, it turns the snspension board with the cuttled piece pressed upwards, the top cuttle then comes in contact with a fixed board, placed across the frame, by the pressure of which the edges are always kept in their places. The other end of the board works in the same manner. The traversing motion of the rack is effected by iron arms worked with a crank from the strap pulley. An apparatus similar to a clock denotes the number of cuttles in each piece, when the cuttling is finished. The length of the cuttle must be the length of the measure used.

MANUFACTURED GOODS.

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FRANCE.

PARIS.—SHAWLS.

Shawls.

There are 32 exhibitors of plain and figured woollen, cashmere, woollen and silk, woollen and cotton, and mixture shawls and scarfs, in India and other styles, of beautiful designs and colours; yarns well spun, very even, thoroughly dyed, and well cleaned. Others are woven with cashmere and all wool yarns, and embroidered with silk, and gold and silver thread. In some cases the gold and silver is woven in as an extra.

The introduction of gold thread into the French productions of this class has been much more successfully accomplished than in those of this country, but as we have the advantage of cheapness of production in other respects, it is hoped that our manufacturers will exert themselves to cultivate a more refined taste in the introduction of this material into the manufacture of fancy articles.

Plushes and velvets.

Five exhibitors of silk, woollen, cotton, worsted, alpaca, cotton and mohair plushes, and velvets of beautiful figures and styles; the plushes being of various lengths. There are also large and beautiful designs in quiltings, the leading styles being those woven with the figure extending from the list to the middle of piece, and reversed from the middle to the other list. There is also a large assortment in fine mixture woollen cloth, the greys taking the lead.

LIGHT FANCY CLOTHS.—Four exhibitors.

Merinos, &c.

One exhibits merinos, plain and fancy woollen cloths, cloths of mohair, silk and woollen, mixed cloths of woollen and cotton; without handling these it is impossible to discover the presence of cotton, the colours and fabrics are so near those in woollen, being generally of light drab, mixtures, and twists.

One exhibits worsted and woollen yarns, and pieces in the grey of ordinary qualities, well manufactured. Another shows cloths woven with cotton warps and horses' hair in weft, for ladies' skirts, both plain and figured.

One exhibits figured and plain hair-cloths, for upholstery.

WOOLLEN AND CASHMERE YARNS.—Two exhibitors.

Woollen yarns.

These are good samples, both in single and double, and in warps and weft, the woollen being worked on condensers—the double is without fault. In evenness and regularity it is perfect. Goods woven with this yarn can never be shady.

ARTIFICIAL WOOL MADE FROM WOOLLEN RAGS.—Three exhibitors.

These are well got up, colours good, and well assorted, and free from dirt and bits.

ELBEUF.

Elbeuf.

Thirty-six exhibitors of fine and low, plain and twilled cloths, fancy trouserings, and paletots, beavers, moleskins, eiderdowns, swandowns, reversibles, cloakings, army cloths, ladies' cloths, billiard cloths, double-milled cloths, felts, and some few waiscoatings, paddings, serges, and listing.

Thomas Chenneviere exhibits fancy trouserings made double width, with two borders down the centre; width of borders running from half an inch to 2½ inches, and worked with spun silk plush of beautiful mixtures and self-colours. Some are embroidered with silk in neat open running styles, in two or three colours: others are raised in round velvet tufts, 1¼ inch diameter at the top, and finish at the bottom with tufts quarter inch wide:—grounds woven with a crape or elastic cloth, of either self-colour or mixtures.

Cloakings with spun silk plush back, and woollen and silk plush face, some in broad stripes across, alternately of plush and plain cloth; also grey alpacas, with plush in imitation of seal skins.

These embroidered borders, as well as the running patterns generally, might be worked by the sewing machine more advantageously than by the embroidering machine now in use, the operation being both speedy and cheap.

Messrs. Osmont and Leroux exhibit trouserings with borders down the middle of the piece of different widths, the same colours as the ground, the borders being

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well frized, and the ground of a neat crape make and finish. These goods look remarkably well, and the style suits all colours. They exhibit others with borders in lace-work.

Lefort and Vanquelin show fine thin summer cassimeres, excellently made, in good colours, of all shades of drabs, and in double widths, for coatings and trouserings.

Charles Flavigny exhibtis trouserings, double widths, fine crape ground, in plain colours of all shades and good mixtures, with extra warp for borders worked up in flowers tastefully arranged.

Edm. Join Lambert is introducing trouserings with plain and mixture colours, of crape make from bottom to knee, and from knee to hip, of different styles, in imitation of large tassels suspended with a cord from the waist; these are woven with the jacquard.

Gass Brothers exhibit paletot cloths with broad fringes up each list, and trouserings with thick silk chenille cord for border, stitched in serpentine and chain work; some have plain silk cord slightly stitched to the cloth in a variety of forms, and with good effect; some with cord of woollen chenille, similar to bell roping.

These trousering were ticketed 12 francs the metre double width, and the makers will execute orders for two trousers lengths, making nearly all colours with one warp, and varying the effect by the wefts.

Lefebre Gariel exhibits samples of his felt cloth, made with woollen warp and weft and linen warp and weft, woven very open and filled up with wool on the felt principle; the cloth being sufficiently strong to answer in place of leather for cards, for which purpose they are using large quantities.

This principle of felting is very superior to that in use in this county, producing greater firmness and more elasticity, and the goods thereby produced might be applicable for many purposes for which our felted goods are entirely unfit.

At this place the manufacturers are making a great quantity of thin fine cloths in blacks, blues, scarlets, greens, browns, purples, drabs, clarets, white, and a variety of other colours, both quiet and brilliant, for exportation to the Levant, Turkey, China, America, and Germany; they are got up with the finest lustre faces, and without exception are perfectly sound and skinny.

A large proportion of the army cloths and officers' unforms are manufactured here.

VIENNE, Isère.

Vienne (Isère).

Twenty-seven exhibitors of various qualities and colours of twilled and plain cloths, a few of whom also exhibit woollen fancy goods. These cloths are invariably sound and made from yarns, worked upon the condenser; some are of the lightest texture, still retaining that firm skinny handle and fine lustrous face so much desired by the eastern markets. The colours, either in piece-dyed or wool-dyed, are excellent, and no ordinary friction or rubbing will bring off the colour.

J. Jullien exhibits stout fancy goods at 5*s.* the metre of 39 inches; McGregor plaids, double width, applicable for either coatings or trouserings and low stout hair lines, double width, 4*s.* the metre.

Lardiere and Co. exhibit fine stout double-width trousersings, with borders, at 8*s.* the metre.

Houles and Co. show a fine assortment of beavers and cloths, closely imitating mohairs, 4 francs 75 cents the metre; superfine double-milled coatings from 10 francs to 12 francs the metre.

SEDAN, Ardennes.

Sedan.

Twelve exhibitors of plain and twilled cloths, satins, zephyrs, ladies' cloths, army cloths, cassimeres, beavers, moleskins, swandowns, ciderdowns, whitneys, cloakings made of wool and cashmere, in piles of goat's hair, alpaca and mohair silk, both thrown and spun, fly or waste, worked with wool and cashmere. Also fancy trouserings of every description, cloths for paletots, &c.

The faced cloths are made from yarns slubbed on the condenser, the face is generally produced by the decatiering. A great many of the showy colours are upon very light cloths, made especially for exportation. The Levant trade is much cultivated.

There are some fine, soft, rich-looking cloths, made of hair piles in rich mixture, being a close imitation of seal skins. Silk is also much used in fly or waste,

thrown and spun for cloakings, producing a fur-like effect. The cashmere wool is also much used for ladies' wear. HUDDERSFIELD CHAMBER OF COMMERCE.

Most of the manufacturers make five or six different classes of goods to suit the requirements of several different markets, the American, Levant, China, and Eastern trade generally.

De Montagnac exhibits excellent plain and figured cloths, velvet piles of mohair, alpaca, cashmere mixed with s lk, for coatings and cloakings.

Reims, Marne.

Eight exhibitors of woollen and worsted, cashmere, yarns, in warps and wefts, double and single. Most of the spinners make both woollen and worsted for home and foreign consumption; generally it is well slubbed and spun. There are some extremely fine samples of spinning and twisting; they are very successful in their blends of wool and cotton, wool and silk, and wool and cashmere. The condensing principle is well adapted for this work; the cotton and silk fly requiring to be worked off the end like worsted, and the wool works equally well in the same way. Reims.

By this adaptation yarns of wool and cotton are much more evenly worked together, than by the process adapted in this country; in fact, it is not easy to detect cotton, as the mixture is quite free from murliness and inequality. Their mixtures and twists of two and three colours, granderelle, and slack twists, are beautifully done.

Fourteen exhibitors of cloths, trowserings, merinos, tartans, shawls, flannels, and waistcoatings, in winter and summer substances. There is nothing here worth particularizing; they are all creditably made, colours good, yarns well spun, and evenly finished.

Lastours, Lisieux, and Vire, Calvados.

Twenty-seven exhibitors of plain, twilled, and satin cloths, beavers, double-milled coatings, and fancy trowserings. Some are woollen yarn spinners. Lastours, &c.

Adr. Lenormand exhibits fine samples of plain and satin cloths, beavers, double-milled coatings, and fancy trouserings. He has made largely of broad cloths during a great many years for America, varying from 9*s.* 6*d.* to 10*s.* the metre; broad fancy coatings from 9*s.* to 10*s.* the metre; plain from 7*s.* to 10*s.* the metre; and low fancies from 1 franc 50 cents to 5 francs 75 cents, in grey mixtures with printed borders.

Roubaix, Nord.

Eighteen exhibitors of woollen weft and cotton warp, silk, wool, and cotton and woollen and silk figured trouserings, woollen, silk, cotton, mohair, and alpaca made up in a variety of ways for paletots, drill trouserings of linen and cotton. Roubaix.

Three exhibit woollen and silk waistcoatings. Four are woollen and worsted yarn spinners. In woollen and worsted weft, and cotton warp trouserings and coatings, they have good samples, in rich brown, black, slate, and drab and white twists, woven in crapes, elastics, and jacquard figures. In some instances they introduce a little silk with great advantage. They always take the best French, all wool styles, for imitation, and they are so well executed that it is difficult to distinguish them from entirely woollen fabrics. The warps and wefts are similar both in thickness and quantity to our own. For paletots they produce exactly the same fabrics as the above, only adopting suitable styles and colours. Both the woollen and worsted yarns are good, and they excel in colouring.

Tourcoing, Nord.

Eight exhibitors of woollen and worsted yarns, wool and silk, wool and cotton, wool and mohair, wool and alpaca mixtures, in white and plain colours, in warps and wefts, double and single. Tourcoing.

Eight exhibitors of broadcloth, ladies' cloth, satins, venetians, double and single merinos, and a few fancy cloths.

Strasbourg and Bischwiller, Bas-Rhin.

Seven exhibitors of plain and twilled broadcloths, satins, cassimeres, and zephyrs, chiefly blacks, both piece and wool dyed, some of them are made remarkably thin for the export trade, fine, clear, firm colours, close, regular face, and quite sound. Strasbourg.

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Limoux and Carcassonne, Aude.

Ten exhibitors of plain and twilled cloths, chiefly blacks: one exhibits black white, and scarlet.

Limoux.

Auguste Roustie, Carcassonne, shows goods in plain cloth of first-rate make; the face is perfectly even and sparkling with lustre; they are both in piece and wool dyed. One specimen of cloth, wool dyed, marked at 9 francs 75 cents the metre, is remarkable for its fine skinny texture.

The heading ends are very neatly managed in the piece-dyed goods by throwing a few shoots of spun silk or soft linen in the white, which takes a light bright slate colour, and without producing the least cockliness in milling.

Warmerville, Bazancourt, St. Masme, Novion Porcien, Isle-sur-Swippe, Pontarn, Val-de-Bois, Marne.

Warmerville, &c.

Eight exhibitors, six of merinos, double and single. This trade appears to be nearly confined to this district, and the samples exhibited are fine specimens of this class of goods. The demand for them is rather limited, owing to their costliness.

Two exhibitors are woollen and merino yarn spinners.

Mazamet, Castres, Bastide-Roaurioux, Tarn.

Mazamet, &c.

Nine exhibitors of plain and twilled cloths, double-milled coatings, beavers, moleskins, swandowns, and tartans, fancy woollen trowserings, in single and double widths. The medium qualities of plain cloth in the finished state have only about forty-eight ends of warp per inch, of about thirty-five skeins. The weft runs about twenty-six to twenty-seven skeins, and well set up in the weaving made with as many shoots of twenty-six skeins weft as there are ends of thirty-five skeins warp per inch, thereby getting a good stout fast piece. By being well wefted the goods stand more gigging, and they are enabled to produce a fuller face than one would expect from their system of slubbing and spinning. These coatings are well made in rich olives, indigo blues, browns, blacks, mulberry, and mixtures. All their colours show a considerable degree of brilliancy; the hair is evidently thoroughly dyed.

The ladies cloths, from the firm of Emile Barber and Co., of Castres, are very handsome. They exhibit a good assortment of them in beautiful colours and of firm satiny handle, although they are of a very thin light texture. They can be compared in handle to nothing so well as the finest kid glove.

Rives, Ulyse, and Co., Mazamet, show goods of jacquard figured coatings and cloakings, 6 francs 50 cents the metre, made with about forty-eight ends per inch of twenty-six skeins warp and thicker weft; also some samples of stout mixture crapes, double width, for coatings and trouserings, 10 francs the metre.

Olembel Freres show cloakings in good styles and colorings, 3 francs 60 cents the metre.

Remorantin, Loir-et-Cher.

Remorantin.

Two exhibitors of plain and twilled cloths, double milled cassimeres and Devon cloths.

Normant Brothers show an assortment of thick double-milled cassimeres and Devons, in drabs of every shade, browns, chocolates, greens, blues, and mixtures in the greatest variety.

They are chiefly worn for liveries. They also show a good assortment of ladies' cloths; great quantities of these are for exportation.

Abbeville, Somme.—Two exhibitors.

Abbeville.

Dupont and Co. exhibit fancy trouserings of good styles, with the Scotch handle of finish, ladies' cloths, and cloakings, with broad mixture plush face, and spun silk backs of bright colors, such as blue, crimson, orange, brown, and maroon, raised to a silk nap, instead of having the cloaks to line with other materials.

J. Randoing and Co. show good samples of plain cloths, free from hardness in finish, though they have a great deal of face; they also show a fine assortment of officers' cloths of great merit.

Beauvais, Mareuil, Sur-Ourcq, Oise.—Two exhibitors.

Beauvais, &c.

Fortin and Co. exhibit a fine assortment of ladies' cloths in crimson, royal blue and black, and some good felts in white, red, blue, and yellow.

ORLEANS, Loiret.—One exhibitor. Orleans.

Hazard Père and Sons show samples of plain cloth, of a good stout full-handle, well-finished, more like a beaver than plain cloth; wool-dyed, in bottle-green and black, 12 francs; indigo blue, wool-dyed, 13 francs the metre.

BORDEAUX.—One exhibitor of beavers. Bordeaux.

LASTOURS, CABARDES, Aude. Lastours.

One exhibitor of piece-dyed black cloth.

LOUVIERS, Eure. Louviers.

Six exhibitors of plain and twilled cloths, satins, and fancy figured coatings and trouserings.

BOULZICOURT, ANGECOURT, RETHEL, PONT-MAUGIS, Ardennes.—Five exhibitors. Boulzicourt, &c.

Four exhibit woollen and worsted yarns, in white and colours, weft and warp, single and double, and one, merinos.

AMIENS, Somme. Amiens.

Three exhibitors, woollen and silk, yarns, fancy trouserings, and shawls.

GLEIZE, LYON, AND VILLEFRANCH, Rhone. Lyon, &c.

Four exhibitors of woollen cloth from Villefranch, six of woollen and cashmere shawls, and one of woollen fancy goods from Lyon.

FOURMIES, WIGNEHIES, MOULINS, LILLE, AVESNE, VILLERS, SUR, NICOLE, NORD. Lille, &c.

Seven exhibitors of woollen merino yarns in white and colours. Two of waistcoatings and woollen trouserings.

BASSES ALPES. BassesAlpes.

Seven exhibitors of plain and twilled cloths in blacks and browns.

BEDARIEUX, PREIMIAN, LODERE ST. PONS, Herault. Lodère, &c.

Seven exhibitors of plain, twilled, and army cloths. The chief plain and twilled cloths are for exportation. The Levant trade is much cultivated by the manufacturers in these places.

FEOLE, CUGAND, HICHELOUP, Vendée. Féole, &c.

Three exhibitors, two of woollens and wool and cotton cloth, and one of woollen yarn.

VILLEPREUX, Seine and Oise. Villepreux.

One exhibitor of scarfs, French cashmere, and woollen shawls, figured, embroidered, and plain.

BUIS, Drome.—One exhibitor of woollen cloth. Buis.

BASSES PYRENEES. Basses Pyrenées.

One woollen dyer exhibits colours in wool and cloth, and shows fine samples of first-rate colours in both materials.

RIBEAUVILLE. Ribeauville.

One exhibitor of waistcoatings in silk, woollen and cotton, and cotton quiltings,

LIMOGES, Haute Vienne. Limoges.

One exhibitor of woollen fancy goods, and woollen and cotton trouserings.

MARVESSLE, Lozere.—One exhibitor of woollen cloths. Marvessle.

ST. GENIERY, CAMARET, RODEZ, Aveyron. St. Geniery, &c.

Four exhibitors of cloth, fancy woollen coatings and travelling rugs.

ST. DIE, Vosges.—One exhibitor of woollen fancy goods. St. Die.

DARDELIN-PRES-BRIONDE, Haut Loire.—One exhibitor of woollen yarns in good colours. Dardelin.

LA SALLES, Haut Alpes.—One exhibitor of waistcoatings. La Salles.

ESSOME, Lein-et-Oise. Essome.

One exhibitor of woollen cloths, for gloves and gaiters, in very neat styles.

PRATS-DE-NOLO, Pyrenees.—One exhibitor of woollen cloths. Prats-de-Nolo.

EMM, ST. COLOMBE SUR L'HERS, Hude.—One exhibitor of plain woollen cloths. Emm.

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LAVELANET, Ariege.

Lavelanet. Two exhibitors of double-milled and fancy cloths, of both winter and summer substances and colours.

BAR-LE-DUC, Meuse.

Bar-le-Duc. Two exhibitors of woollen cloths and woollen and cotton cloth, woven plain, aced, and got with very good effect.

MENTANBAN, Tarne-et-Garonne.—One exhibitor of plain and fancy cloths.

NANCY, Meurthe.

Nancy. Three exhibitors of plain and twilled cloths, double milled cloths for coatings and liveries.

QUILLESTRE, Haut Alpes.

Quillestre. One exhibitor of woollen and cotton linings in plain colours, plaids and mixtures.

Maet. MAET, Sarth.—One exhibitor of plain cloths.

Loches. LOCHES, Indre and Loire.—One exhibitor of woollen yarns.

PRUSSIA.

AIX-LA-CHAPELLE.

Aix-la-Chapelle. Twenty-seven exhibitors of plain and twilled cloths, in black, brown, blue, and some few in scarlet, and other colours, suitable for exportation and ladies' wear.

Many manufacturers make, in addition, beavers, moleskins, eiderdowns, pilots, army and navy cloths, drabs for liveries, and fancy woollen trouserings in great variety.

Two exhibitors of woollen yarns, in white and colours, double and single, for warps and wefts. One exhibitor of woollen shawls.

G. Kuetgen and Son exhibit a fine assortment of jacquard figured woollen and silk trouserings and coatings.

J. F. Lochner exhibits a fine assortment of plain and twilled cloths. These are faced with the hollow steam roller, called here "the old method." Also some fine samples of cloths in white for the army, which are very good imitations of leather. The effect is obtained by working into the cloth, in a wet state, a large quantity of chalk or whiting; the face afterwards being raised and cropped, comes out quite clear, but leaves the body and back of the cloths exactly like leather.

Feaux and Riedel exhibit a coating cloth with woollen and silk warp, brought up in a sort of broken twill, half-dry finish, in blue, black, and mixtures, 54 inches wide, in woollen silk, 12f. 25c.

Chas. Nellessen and Co. exhibit a good assortment of plain and twilled broad and narrow cloths, of superior make, finish, and colour.

MONTJOIE.

Montjoie. Seven exhibitors of fancy woollen trouserings and coatings, composed of all wool, wool and cotton, and wool and silk, in great variety; in styles, colours, and make closely resembling the French cloths.

J. W. Muller and J. H. Elbers produce some of the best made goods, with the most tasteful styles and colours.

BORCETTE.

Borcette. Six exhibitors of plain and twilled cassimeres, satins, and double-milled cloths. A few of them show fancy trouserings, coatings, and buckskins. Woollen weft and worsted warp trouserings are also shown from this town.

H. Paule and Buchkolz have a fine assortment of trouserings, made with worsted warps and woollen weft, woven in good fabrics and colours; they are handsome-looking goods. The prices range from 3f. 80c. to 4f. 35c. the metre, in browns, drabs, blacks, and other colours. There are also some elegant woollen fancy goods in jacquard figures, in winter substances, at from 5f. to 8f. the metre.

GLADBACH.

Gladbach. Six exhibitors, chiefly woollen, woollen and cotton buckskins, and figured trouserings, well selected for colour, styles, and make.

S. P. Camphausen and Kupper exhibit a superb assortment of cotton warp and woollen weft trouserings, figured and coloured after the French styles, for exportation. These goods are beautifully made, and finished exactly like all wool goods. **Price 2f. 40c. the metre,** 27 inches wide.

LENNEP.

Lennep.

Three exhibitors of plain, twilled, and satin cloths, and woollen fancy goods.

Helger Freres exhibit first-class twilled cloths in broad and narrow widths. They obtained a medal at the American exhibition of 1853 for fineness of thread and excellence of manufacture. In one piece, marked 20f. the metre, the threads are 128 per inch of warp, when in a finished state, and weft in proportion. The lowest priced piece, double width, 8f. 90c., 96 ends per inch narrow width. Trouserings of a stont substance are 5f. 21c. the metre, indigo blue; blacks are lower.

Pierre Schurmann and Schörder exhibit fine double width twilled cloth, in Indigo blue; with smart full short nap and skinny handle, 14f. 30c. One piece at 14f. 63c. contained 112 ends per inch of warp, indigo blue.

WERDEN KELTWIG.

Werden Keltwig.

Five exhibitors of plain, twilled, and satin cloths, pilots, and beavers, in blue, brown, and black, well manufactured, 20f. the metre, 54 inches wide. The manufacturers from this place also show some good buckskins.

EUPEN, DUREN, AND IMGENBROUCH.

Eupen, &c.

Nine exhibitors of plain, twilled, and satin cloths, fancy coatings and trouserings. The cloths frem Eupen are not equal either in make or cheapness to the others. From Duren and Imgenbrouch are sent some fine samples of plain and twilled cloths, from 6f. 50c. to 18f. in brown, blue, and black. One piece of coating cloth, made with velvet face, of a rich gold and brown mixture, is extremely good and perfectly made.

Two exhibitors of shoddy pulled from woollen rags, well assorted in colours, of good staple, and moderately free from bits.

RHEYDT, Prussia Rheinam.

Rheydt.

Two exhibitors of woollen weft and cotton warp trouserings.

Daniels and Sons have the largest assortment in this class of goods; their object is to imitate the French fancy woollens as closely as possible. In woollen weft and cotton warp goods, to a great extent they succeed. Prices 2f. 40c. and 2f. 25c.; they are chiefly woven with weft faces. They also show elastics, crapes, prunells, and stockinett cloths, in rich chocolate, blacks, browns, blues, slate, and lavenders; also twists of every shade beautifully thrown together. Many of the warps are of grandrelle twist alone, 72 ends per inch. They also exhibit ladies' cloakings made with 40s grey cotton warps, woven in cassimere twills, with very thich soft cotton roving for weft. They are then printed in large broad figures, some are dyed in bright showy colours, and then raised in a very long nap, in imitation of our buffalo skin and mohairs.

BRANDEBOURG, sur Havel.

Brandebourg.

Three exhibitors of plain, twilled, and ladies' cloths, cloakings, linings, and low fancy trouserings, double width fancy goods, stout substance, 7f. 40c. to 7f. 90c. Stout cloth, black, aud olive, 6f. 50c.; blue, 6f. 40c. rather open face, but quite sound, 54 inches wide.

SAGEN AND GOLDBERG, Silesia.

Sagen.

Seven exhibitors of fine, plain, twilled, ladies' cloths, and beavers in a good variety of colours, prices ranging from 10f. to 18f., one piece of black plain cloth at 4f. 75c., piece-dyed.

LUCKENWALD.

Luckenwald.

Four exhibitors of cloths, army cloths, buckskins, woollen fancy trouserings, coatings, and drab fancy goods, 4f. the metre. Reversible beavers, 14f. to 19., 54 inches wide.

THURINGUE, ANHALT, MUHLHOUSEN, AND LIMBOURG.

Thuringue, &c.

Five exhibitors of cloths, also cloakings resembling the Leeds cloakings, 48 and 50 inches wide, 3f. 20c. to 3f. 65c. Good samples of woollen linings are also sent from these places.

HUDDERSFIELD CHAMBER OF COMMERCE.

Berlin.

BERLIN.

Six exhibitors of robe de chambre cloth, made of wool, cotton, and silk, cloakings of mohair and wool, fancy waistcoatings, wool and cotton, and all-wool shawls, in great variety. Cloakings of wool, cotton, and silk. Plush waistcoatings of considerable merit in every available material. Army cloths in low and fine qualities.

SUMMERFELD, Brandebourg.

Summerfeld. Guben.

Six exhibitors of plain, twilled, and satin cloths. None of these are of superior make.

GUBEN, Brandebourg.

Four exhibitors of plain, twilled, and satin cloths, all of much excellence.

FORST, Brandebourg.

Forst.

Six exhibitors. All buckskins of superior make, finish, and colour.

Brandebourg towns.

ZIELENZIG, JORDAN, POTSDAM, FRAUENMUHLE, NEWDAMM, PEITZ, HERMANSHOF, FINSTERWALD, SORAN, SCHWIEBUS, COTTBUS, SPRENGBERG, all in Brandebourg.

Seventeen exhibitors of plain, twilled, and satin cloths, buckskins, and other fancy trouserings.

SIEGEN HAGEN, Westphalia.

Siegen Hagen.

Five exhibitors. All plain, twilled and satin cloths, some of great excellence well finished, and brilliant in colour.

ELBERFELD.

Elberfeld.

Two exhibitors, one of worsted and woollen yarns, in mixture of wool and silk for waistcoatings, and one of woollen cloth, waistcoatings, shawls, and plush trimmings, in wool, silk, and cotton.

COBLENTZ.

Coblentz.

One exhibitor of flannels, blankets, horse sheets, and travelling rugs.

HUCKESWAGEN.

Huckeswagen.

Three exhibitors of plain, twilled, and satin cloths, cassimeres, and reversible coatings, most of these are of superior manufacture. The reversibles have mohair back and beaver face.

DULKEN, HERDECKE, BARMEN, LIEGNITZ, BOURG, YESSNITZ, WITSTOCK, TSCHILLE, AND HATTINGEN.

Dulken, &c.

Nine exhibitors. All cloths and buckskins.

In these places they are making beautiful cloths in imitatation of furs for cloakings, in plain colours, with long plush face. In shawls they are working the Indian styles, with two warps and two wefts, odd pick; also with small shepherd plaids and mixture grounds, and tartan plaid borders.

BELGIUM.

LIEGE.

Liège.

Fourteen exhibitors of plain, twilled, satin, and ladies' cloths, of every variety. In make, finish, and colours, closely following the French. They show a fine assortment of beavers, pilots, army, navy, and billiard cloths, and a few horse sheets, and travelling rugs of some excellence. Two exhibitors of yarns for home and export trade.

BRUSSELS.

Brussels.

Five exhibitors. All fancy goods, woollen and cotton trouserings, shawls, coatings, travelling rugs, frises, and kerseys.

VERVIERS.—One exhibitor of cloths, cassimeres, and fancy goods.

In this district they are doing a brisk trade in cloths, machinery and yarns, a great quantity of yarns being sent to Scotland.

Tamise.

TAMISE, EECLOO LOTH.

Three exhibitors of woollen yarns, fancy trouserings, gala plaids, tartans, satins, and shawls.

AUSTRIA.

HUDDERSFIELD CHAMBER OF COMMERCE.

BRUNN, Moravia.

Ten exhibitors of plain, twilled, and ladies cloths, some of great beauty, and at very low prices.

Brunn.

Twenty exhibitors of cloth and fancy woollens, in trouserings and coatings, in every variety. Some of the trouserings are of great beauty in design and colouring. Coatings of all descriptions at low prices.

One exhibitor of army cloths, and four of woollen yarns.

VIENNA.

Vienna.

Fifteen exhibitors of shawls and waistcoatings, in every available material and style. Many of the shawls do them great credit. Their colours are good and well arranged. The waistcoatings are generally good. Several assortments of quiltings well woven, and nicely got up in the finish, quite clear in colour, and very chaste in design. Two or three lots of waistcoatings in the shawl and India styles are distinguished for the harmony of colours and adaptation of design. They are woven chiefly with five colours, wefts carded, worsted and silk, and cotton warps.

BIELITZ, Silesia.—Seven exhibitors of plain and twilled cloths.

REICHENBERG, Bohemia.

Reichenberg.

Six exhibitors of plain and twilled cloths, in both fine and low qualities.

JAIERNOF, Silesia.

Jaiernof.

Five exhibitors of plain cloths of all qualities. Their low cloths are perfectly sound.

FUNFHAUS, near Vienna.

Funfhaus.

Four exhibitors of wool, and woollen and cotton shawls and scarfs.

NAMIEST, WISCHAN, NEURARSSNOTZ, SENFTENBERG, all in Moravia.

Namiest, &c.

Five exhibitors of wool, and woollen and cotton fancy trouserings, of great variety, and elegance of style and colour. Some of the woollen weft and cotton warp goods are well made, with a great amount of taste and skill, in fabrics, colours, and finish. Some have worsted and cotton twist weft, closely following the French in colour and design.

RUMBOURG, Aicha Bohemia.—Two exhibitors of woollen fancy goods. Rumbourg.

SELTSCH, WEISKIRCH, SOMNITZ, SALZBOURG, AND VENISE.—Five exhibitors of fancy woollen trouserings. Seltsch, &c.

SCHIO AND COMO, Lombardie.—Three exhibitors of woollen fancy goods. Schio.

GRADWEIN, Styrie.—One exhibitor of woollen fancy trouserings. Gradwein.

KLAGENFURTH, Carinthie.—One exhibitor of woollen fancy goods. Klagenfurth.

The Austrian goods show that the manufacturers are not wanting in skill and enterprise. Their machinery is an unmistakable testimony of their advanced mechanical knowledge, and the number of exhibitors is a proof that they are not afraid of bringing their productions into competition with the manufacturers of other countries.

SPAIN.

BARCELONA.

Barcelona.

Seven exhibitors of all-wool, and wool, silk, and cotton shawls, of good colour and design. They appear to have good taste for combinations of colour. Many of the figures are worked with the jacquard loom. Their waistcoatings are very creditable.

TARRASA, Catalonia.

Tarrasa.

Four exhibitors of plain, twilled, and satin cloths, beavers, eider downs, and other soft heavy coatings; also a few tartans and flannels.

Antonia Galing and Co. have some nice samples of reversibles in light mixtures, well milled and finished, full and skinny in hand. In summer and winter trouserings they stand well. They are now introducing military borders in

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velvet, plush, worked down the middle of the piece like the French cloths. They are woven in with the circular machine, fixed in the middle of the going part.

Sabadell.—Four exhibitors of cloth, woollen satins, and beavers.

Burgos.

Burgos.

One exhibitor of merinos, closely resembling the French cloths.

SWITZERLAND.

Zofingue, Argovie.

Zofingue.

Two exhibitors of cassinets, buckskins, and woollen and cotton trouserings The woollen and cotton trouserings are made with double cotton warp, and woollen weft on the face, and backed with cotton weft, producing a strong and durable cloth.

WURTEMBERG.

Goeppingen, Reuthngen, Esslingen, Metzeugen, Stuttgart, Calw, Bietigheim, Heidenheim.

Goeppingen, Stuttgart, &c.

Eight exhibitors. Four of plain, twilled, satin, and zephyr cloths; and four of fancy woollen trouserings, all in the French styles.

Their fancy woollen trouserings are of first-class manufacture, at fair prices. They also make fine double twist warp goods, in jacquard figures, with mixture of silk and wool; averaging 5 f. 6 c. the metre, 28 inches wide. Without silk 4 f. 70 c. the metre.

SAXONY.

Grossenhayn.

Grossenhayn.

Four exhibitors of yarns, plain, twilled cloths, coatings and trouserings, wool, dyed broads in black, blue, brown, and dark sage, well made and finished, 12 f. to 13 f. the metre; and fine broad cassimeres, 112 ends of warp per inch, finished, weft in proportion, in blues and black, at 11 f. to 13 f. the metre.

Glauchau.

Glauchau.

Three exhibitors of woollen and cotton goods, for trouserings and coatings.

Crimintchau.

Crimintchau.

Three exhibitors of yarns and wool, cotton, and silk trouserings, and woollen buckskins. These are of fair average manufacture.

Reichenbach, &c.

Reichenbach, Bisschofswerda, Leisnig, Boehrigen, Chemnitz, Legenfeld.

Six exhibitors. All woollen cloths, in black and other colours, of excellent qualities.

HOLLAND.

Roermond, Leiden, Delf.

Delf, &c.

Four exhibitors. One of fancy wool and cotton goods, the others of woollen cloth.

Bavaria.

BAVARIA.—One exhibitor of buckskins.

Grand Duchy of Baden.

GRAND DUCHY OF BADEN.

Loerrach, Lahr.

Two exhibitors of shawls and waistcoatings, in wool, silk, and cotton, woven in plain and figured styles.

Grand Duchy of Hesse.

GRAND DUCHY OF HESSE.

One exhibitor of woollen shoddy, in well-assorted samples.

Grand Duchy of Luxembourg.

GRAND DUCHY OF LUXEMBOURG.

One exhibitor of woollen cloth and fancy trouserings.

PORTUGAL.

Portugal.

Covilha, Castello Branco.

Two exhibitors of cloth, cassimeres, heavy low coatings, and druggetings.

Porto.—One exhibitor of cloths and cassimeres.

Portalegne.—Two exhibitors of cloths and cassimeres.

SWEDEN.

Huddersfield Chamber of Commerce.

Sweden.

Norrkoping, Ostrogothie.

Six exhibitors of double milled satins, wool-dyed blue pilots, and army cloths. Every class is well represented, and the goods do credit to the exhibitors.

Gothembourg, Boras, and Eyhoping.

Three exhibitors. Two of woollen cloths, and one of all-woollen shawls and neckerchiefs.

NORWAY.

Norway.

Christiana.—Two exhibitors of army cloths and plain cloths.

Farsund, Hammerfest, Rökke, Bingen.—Three exhibitors of heavy low cloths, pilots, and surges.

ENGLAND.

Great Britain:—

Leeds.—Eleven exhibitors of woollen and fancy goods.

Upon these the deputation sent by the Leeds Chamber of Commerce have made their own report.

Huddersfield.

Huddersfield.

Four exhibitors.—*I. and T. C. Wrigley and Co.* exhibit very superior coatings in the leading styles, also very fine specimens of reversible mohair coating cloth mohair on one side, and full satiny beaver cloth on the other, which were superior to any others exhibited. They also exhibit fine cut velvet cloth made of silk and wool, for cloakings and coatings, which possesses great novelty. Messrs. Wrigley obtained a first-class medal.

J. T. Clay exhibits some well made thin woollen trowserings.

J. Day exhibits excellent specimens of cassinetts and silk and wool cashmeretts of considerable merit.

Jonas Brook and Brothers exhibit an excellent assortment of thread, for which they were awarded a first-class medal.

London.

London

Six exhibitors of cloths, cassimeres, and satins, coatings, liveries, and cloakings, fancy trouserings, worsted and cotton waistcoatings, and woollen shawls in tartans and tweeds.

The goods shown by the London houses were well selected, and evidently made by some of our best manufacturers. All the classes are sparingly, but choicely, represented.

The West of England

West of England.

Was represented by four exhibitors of fancy woollen coatings and trouserings.

J. Stancomb and Sons and W. and J. Stancomb, Trowbridge, exhibit a great variety of fancy woollen trowserings, in neat styles and colours, and well finished.

Salter and Co., of Trowbridge, show an assortment of neat fancy trowserings.

There is little novelty of design in the goods from this district.

Leicester, Norwich, Kendal, Dewsbury, Wilts, Witney, Chipping-Norton, and Wakefield.

Leicester,&c.

Eight exhibitors—three of yarns, two of woollen shawls and cloakings, the rest of coatings, black and white woollen trouserings, horse sheets, and travelling rugs, of great variety and excellence. The black and white tweeds from Kendal are very good in colour and mixture.

SCOTLAND.

Scotland:—

Glasgow.

Glasgow.

Seven exhibitors of fancy woollens, woollen and cashmere shawls and tweeds.

A. Paul and Co. exhibit fancy woollen goods, which in colour, style, and make are good samples of this class of manufacture.

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D. Macfarlane and Co. show excellent samples of Scotch tweeds.

Henry Brown and Co. exhibit printed shawls of good design and colour.

Wingate, Sons, and Co. exhibit shawls of fine soft woolly handle, and clean fast colours.

HAWICK.—Three exhibitors of plaids and tweeds.

Hawick.

Wilson and Armstrong exhibit good samples of Scotch tweeds and plaids.

W. Wilson shows Scotch shawls and tweeds, all wool, in neat styles and colours.

PAISLEY.—Two exhibitors.

Paisley.

John Morgan and Co. exhibit shawls of woollen and silk, of fine light texture, and woollen tartan plaid shawls, in rich colours and fine soft handle.

Hutchinson and Forbes also exhibit a good assortment of shawls.

SELKIRK.—Two exhibitors of tweeds and plaids.

Selkirk.

The Kendal and Scotch tweeds, shepherds plaids, grey mixtures, and tartans, in shawls and trowserings, are superior to any exhibited, in purity and firmness of colour, and fine soft woolly handle. Compared with them, the Continental manufactures of this class are of very inferior quality.

Report of the Deputation appointed by the Leeds Chamber of Commerce on the Woollen and Worsted Fabrics and the Iron Manufactures in the Paris Exhibition.

Leeds Chamber of Commerce.

At a Meeting of the Council of the Leeds Chamber of Commerce, held on Wednesday, September 12, 1855, the following resolution was unanimously passed :—

Resolved,—"That in order to carry out the views of the Board of Trade, (see p. 107) the following gentlemen be appointed a deputation to visit the Exhibition, and report accordingly. The deputation to have power to add to their number, or to avail themselves of the observations of any practical persons from this district who may visit the Exhibition and assist them in their labours ; namely, Darnton Lupton, Esq., Vice-President ; Edward Irwin, Esq. ; Walter Stead, Esq. ; George Smith, Esq. ; James Kitson, Esq. ; George S. Beecroft, Esq. ; John Wilson, Esq., and the Secretary.

The deputation was accompanied and assisted by two of the Trustees of the Colored Cloth Hall, Mr. Samuel Ellis and Mr. Robert Hardaker, also by the following delegates from the Clothiers, Mr. George Stansfield, of Pudsey, Mr. William Winterburn, of Yeadon, and Mr. John Wilson, of Calverley.

REPORT.

The deputation examined with minute attention the various sections of the Exhibition, and they believe that much good will arise from the great amount of information obtained, and which will be disseminated through the district, tending to stimulate the energy and encourage the enterprise of all classes of producers in this part of the West Riding.

Several important branches of Leeds manufacture were almost entirely unrepresented. Of these may be mentioned the flax spinning trade in which Leeds stands in the foremost place for the extent as well as the character of its productions. The leather trade was only represented so far as the Spanish leather manufacture is concerned, in which branch a prize was obtained ; no heavy goods were exhibited

Trades not represented.

LEEDS CHAMBER OF COMMERCE.

from this neighbourhood. The manufactures of glass, silk, pottery, stoneware, and several other considerable items of Leeds production had no representation whatever, which is much to be regretted, as the opportunity may not speedily occur again of bringing so completely under public notice the varied character of the industry of the town and neighbourhood, respecting which the ordinary notion is probably confined to the knowledge of its large trade in woollen goods.

Woollen manufactures.

In forming an estimate of the comparative position of the woollen manufactures of the various countries of the Continent, and especially in contrasting them with our own, it is very needful to distinguish as far as possible between the special efforts made for the Exhibition and the general character of the goods entering into consumption and forming the bulk of the products of the respective districts. The Exhibition in itself is to a considerable degree misleading in respect of this essential point, as the magnitude and excellence of particular countries are not at all an index of the relative importance of the districts represented. Brünn, in Moravia, for instance, fills a space four or five times more extensive than the West Riding woollen manufactures occupy, and to this circumstance, aided by the truly admirable manner in which the goods exhibited are arranged and displayed, together with the tasteful selection of colors for contrast, must in some measure be attributed the impression prevalent in various quarters that this district is surpassed by Austria in its leading article of production. The deputation did not therefore confine themselves to a comparison of the goods in the Exhibition among themselves, but took into consideration the producing powers of the different districts, so far as they could obtain information, in order to judge whether the displays represented a special effort, or merely, as in the case of Leeds, a selection of such goods as were daily selling and producing in quantity without any reference to a competition for honours. Tried by this practical test, and compared with the general productions of the West Riding, the woollen manufactures of the Continent do not, in the judgment of the deputation, equal our own in the very important requisite of adaptation by both price and quality to the consumption of the great masses of the population of most countries.

Space occupied by Brünn.

Excellence of foreign cloths.

It is impossible to deny to the cloths of France, Austria, Prussia, and Belgium great excellence of make and beauty of finish and colour, but in the majority of instances where superiority can be fairly claimed by them over the English goods, it is in the finer class of fabrics, those suited only to

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a limited demand, or to particular markets, rather than in the common and more popular descriptions.

Belgian cloth.

The fine cloths of Belgium are light, thin, and fine-looking, and well adapted to hot climates; are generally well made and some well finished, but there appears great diversity in value, and as a general rule prices run high.

Fine army cloths.

From Klagenfurth, in Carinthia, there are some fine army goods in maroon, white, rose, amber, orange, and scarlet, of which the colours are even and superb, but the prices running from 20*s.* to 24*s.* per yard, take them out of the category of ordinary consumption.

Cloths of Brünn.

The Brünn goods generally are excellent; and especially should be noticed army goods in all colours, reds, greys, whites, and yellows, 42 to 44 inches wide; are cropped and pressed, stout, and very well made, perfectly sound, and the prices from 3*s.* 9*d.* to 5*s.* per yard.

French woollens.

The French goods in the low qualities are coarse but strong, and mostly very badly finished; middle qualities, principally blues, from 9*s.* to 12*s*, the yard, are stout and well made, and are admirably adapted for military, naval, and police purposes, and apparently prepared chiefly for those services; they are made of strong wool and very highly finished, and would no doubt turn a heavy shower of rain. Finer qualities from 14*s.* to 20*s.* are well made but dear.

Prussian goods.

The Prussian goods, Aix la Chapelle, Duren, Eupen, &c., are in general excellent goods, and well finished, but the deputation were not permitted to examine the majority of the goods from the former place; the displays from Verviers and some other Belgian towns were also so exhibited as to preclude an accurate judgment of their value, but there seems no reason to suppose that any change of opinion would have resulted from a closer inspection.

Görlitz and Sommerfeld.

From Görlitz and Sommerfeld there are exhibited excellent goods, the middle and finer qualities very superior. Reversibles from 14*s.* to 20*s.*, 2½ lbs. per yard, are magnificent, and the colours of mixtures are beautiful.

Superiority of Leeds cheap woollens.

In useful common qualities of woollen goods, at prices within the reach of the poorer classes, as displayed in the department of the Exhibition termed the museum of domestic economy, and which was specially devoted to low-priced productions of every kind, the deputation unhesitatingly claim the superiority for Leeds and its neighbourhood, there can be no question upon this point.

Orders of French Government.

The fact that the French Government have ordered in this neighbourhood large quantities of goods for army and navy use during the past year, sufficiently indicates their coincidence in opinion in this respect.

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Leeds stall.

Generally, the goods from foreign countries were beautifully put up, and contrasted in this respect favourably with the Leeds stall, which had every disadvantage of situation, deprivation of light, and want of taste and judgment in the method of exhibiting.

Exertions made on continent to improve.

The attention of our manufacturers and merchants ought to be awakened to the spirit of enterprise which evidently characterizes in a great degree their Continental competitors. It is certain that the latter are making every effort to attain a position of superiority. All new processes are tried with a disregard to immediate outlay, which cannot but give great encouragement to inventors, who find their reward certain if their improvements are practical; and the deputation earnestly urge upon the manufacturers of Yorkshire a greater degree of liberality and of enterprise in the adoption of new machines and improved methods than has appeared latterly the case.

Machinery.

A consideration of the machinery generally in use upon the Continent cannot but conduce to a conclusion similar to that now expressed by the deputation. The machinery for scribbling and preparing wool at present chiefly employed here, has been totally cast aside by the Continental manufacturers, and it is presumable that they have done this from a fixed conviction of the superiority to the new methods. At the same time the deputation are perfectly satisfied that machinery can be obtained from the machine makers of this town, and in a few cases is already working, which is equal, and in some important instances decidedly superior, to that in universal employment in France, Belgium, Prussia, and Austria. Let our manufacturers in the true spirit of improvement commence at once the trial of the methods which experience has shown to be an advance on the old ones, let them strive resolutely after excellence, whilst keeping economy in view, and in the judgment of the deputation, the West Riding may with confidence anticipate the maintenance of its manufacturing position.

Dyers and finishers.

The same appeal should be made to the dyers and the finishers, both of whom require to be made aware of the remarkable degree of science and practical skill displayed by the foreigner, and to be stimulated to greater efforts and a higher standard of excellence.

Education of workmen.

An improved scientific education for the class engaged in practical superintendence of our factories, a better acquaintance with the chemistry of the arts, with the principles of mechanics, and with the investigations of scientific men into the nature and character of the infinite variety of raw material; these are objects to which the efforts of all well-

wishers of England as a manufacturing country should be turned with unceasing energy. LEEDS CHAMBER OF COMMERCE.

There is perhaps nothing more striking in the Exhibition than the evidence of the progressive development of the iron trade on the Continent, particularly in France and the Prussian dominions, and in an especial manner as applicable to railway and marine purposes; although it ought to be observed that the specimens exhibited indicate that neither labour nor expense have been regarded in their preparation, and it is manifest that great efiorts have been made to produce a powerful impression on all who are interested by this demonstration of their large capabilities. Iron trade.

The magnitude of many of the specimens shown is very striking, as indicating remarkable powers of manipulation; for instance, a bar of iron 10¼ inches diameter, length 23½ feet, weighing 6,518 lbs., and a boiler plate 17 feet by 5 feet 5 inches, and ½ inch thick, weighing 2,003 lbs. English. Also a hammered plate for a floating battery measuring 18 feet by 37½ inches, and 4 inches thick—this latter is a eautiful specimen of workmanship in every respect. The largest boiler plate exhibited, measured upwards of 24 feet by 5 feet, and its weight was 2,500 lbs. Magnitude of specimens.

Those able to judge of the comparative qualities of iron would certainly look with no ordinary interest on the excellent specimens of railway tires and axles exhibited by several makers. A few years ago these articles were imported exclusively from England, and in fact chiefly from our own district; it therefore behoves our manufacturers to use strenuous exertions, if they intend or desire to maintain their well earned position of superiority. Railway tire axles.

The sheet iron exhibited by Belgium deserves special notice; their mode of manufacture securing a beautiful evenness of surface which the English manufacturers have not hitherto equalled. Sheet iron.

One the most interesting and extraordinary groups of specimens connected with the metal trades, is Krupp's exhibition of cast steel, adapted to various purposes, as railway tires, axles and cranks, and polished steel rollers. He shows one ingot of cast steel weighing 11,030 lbs. Krupp's cast steel.

Although the progress made in the iron trade upon the Continent is so marked, still it requires only the continuance of the energy and enterprise for which the manufacturers of England have always been distinguished, to hold their advanced position in respect of the combined requisites of excellence of quality and cheapness of production. In the important points of abundance, variety and excellence of the Advantages possessed by England.

LEEDS CHAMBER OF COMMERCE.

raw material, both coal and iron, and in the facilities of transit by railway or water carriage, England, and this district in an especial degree, possesses advantages that are enjoyed by few if any of her rivals.

Locomotive engine building.

As the construction of locomotive engines is a department of mechanical and engineering science of great interest to this locality, although no contributions were sent to the Exhibition by the Leeds manufacturers, the deputation examined with care and interest the specimens sent by various countries.

English engines.

Only two engines were sent from England; one was an ordinary express engine of the form made by one of our leading manufacturers, and the other was exhibited to illustrate the principle of some recently patented modifications of the parts of the locomotive connected with the combustion of the fuel. Each of these engines may be safely said to have sustained the high reputation of this country in this department.

Exertions of foreign makers.

Great efforts appear to have been made by the Continental manufacturers to exhibit engines of first-rate character. France, Belgium, Prussia, and Austria have, all of them, shown very creditable workmanship; and an examination of their details of finish shows that the operative mechanics of the Continent are making considerable progress in manual skill and powers of manipulation. Several of the specimens of locomotives exhibited were, however, simply copies of engines made in this country five or six years ago. Some of the contributors have evidently attempted to produce novelty of design, but the changes made do not seem, for the most part, to be improvements;—that which our English makers have long aimed at, viz., simplicity of construction, has not, apparently, been an element sufficiently taken into consideration by the designers of the engines alluded to. In no department of the Exhibition has the practical character and adaptive capability of the English mind been more strikingly manifested than in that of the locomotive engines; this must have impressed the most casual observer upon comparing the beautiful simplicity of construction of the English engine first alluded to, with any of the novel engines of the Continental exhibitors.

Simplicity the great object.

Machine tools.

Machine tools have now become a very important item in the general machine making business, and Leeds may fairly claim to stand in the very first rank as regards this branch of industry, both in respect of the quality of the workmanship and the amount of production. It is satisfactory to report that the reputation of the town has been worthily

sustained by several exhibitors, whose contributions yielded to none in the exhibition in point of excellence both in design and workmanship. So far as the deputation can judge, no serious competition is yet experienced from the Continent in this department, but with the general progress of the metal trade an advance in the manufacture of machine tools may be anticipated. The awards of the Jury sufficiently attest the eminent position attained by the Leeds machine makers in their respective branches. LEEDS CHAMBER OF COMMERCE.

There is much reason to hope that the tendency of the Exhibition will prove to have been strongly towards a relaxation of the strict protective system of France. Familiarizing the people with the productions of England and other countries, which in innumerable instances, and particularly in the useful and necessary articles of everyday life, are far cheaper than those of France, it may well be hoped that the Universal Exhibition has promoted the growth of a sound public opinion which will afford a powerful support to the Government, whose desire for a more liberal system of tariff duties can hardly be doubted, in the event of the introduction of measures having that object in view. Free trade.

The fallacious system of drawbacks on exportation would probably be revised or given up altogether, simultaneously with the introduction of a more reasonable tariff. The injustice is so palpable of taxing the community to enable manufacturers to carry on a profitable export trade, whilst the home consumption remains at its natural high price, that this mistaken policy must yield to the advancing enlightenment on economic subjects, which will result from the increased attention these questions now receive in France. Drawbacks.

It will be satisfactory to the public of Leeds to observe that the town has issued from the competition with considerable credit, as will be seen from the annexed list of honors awarded by the mixed International Jury. In justice, however, to the exhibitors of woollens, it should be mentioned that a distinction which was drawn by the Jury betweeen merchants and manufacturers, and of which no previous notice was given, has unquestionably prevented the award of a larger number of prizes for woollen cloths. The jury declared that they could take no cognizance of any goods exhibited by others than the actual manufacturers, thus excluding from the competition some of the best and most characteristic specimens of the productions of this district. To those acquainted with the system of manufacturing pursued in the West Riding, and the great division of labour in the production of cloth, this distinction will appear, as it undoubtedly is, unfair and invidious. Exhibitors from Leeds and honour awarded.

LEEDS CHAMBER OF COMMERCE.

The following is a list of the exhibitors from Leeds and its vicinity, with the prizes and honors obtained:—

D. & J. Cooper, Woollen Cloths.
Gill, Bishops, & Hewitt, Woollen Cloths; Honourable Mention.
Hagues, Cook & Wormald, Blankets; 1st Class Medal.
Hargreave & Nusseys, Woollen Cloths; 1st Class Medal.
Hudson and Bousfield, ditto 2nd Class Medal.
Edward Irwin, ditto.
Wm. Lupton & Co., ditto.
Pawson, Son, and Martin, ditto Medal of Honor.
Wm. Smith, Son, & Co., ditto.
Stow, Brothers & Co., ditto and Blankets, Honourable Mention.
James Walker & Co., Billiard Cloths.
Darnton Lupton, Esq., Vice-President of the Chamber of Commerce, Cheap Woollens, Decoration of Legion of Honor, and 1st Class Medal.
Joshua Buckton & Co., Machine Tools, 1st Class Medal.
Shepherd, Hill, and Spink, ditto 2nd Class Medal.
Smith, Beacock, and Tannett, ditto 1st Class Medal.
John Hattersley, Spindles and Flyers, 2nd Class Medal.
Wilson, Walker, & Co., Fancy Leather, 2nd Class Medal.
J. W. Leather, Designs and Models, 2nd Class Medal.
Edw. Sewell Fulneck, Models.
Wm. Clark & Sons, Saddlery.
Carrett, Marshall, & Co., Pumps, 2nd Class Medal.
C. Pegler, Linen Damasks.
J. & J. Hopkinson, Pianofortes, 1st Class Medal.
John H. Saddler, Wheels.
W. Hill, Design for Town Hall, Preston
J. Gill, Bleached and Dyed Goods.

REPORT of the PRESIDENT of the CHAMBER OF COMMERCE, LIVERPOOL, on the SAMPLES of GENERAL PRODUCE and of COTTON in the PARIS EXHIBITION, 1855. LIVERPOOL CHAMBER OF COMMERCE.

IN order to discharge the duty imposed on me by the Chamber, of carrying into effect the suggestion made by the Board of Trade for making a report on the various kinds of imports of raw produce exhibited in the Paris Exhibition, and especially by the Colonies of the United Kingdom, &c., on arrival in Paris I conferred with Mr. Cole, the Commissioner, and Captain F. Fowke, the Secretary, of the British section of the Exhibition, from whom I received every attention and assistance in their power to give. Arrival in Paris.

Owing to the very few visits which the shortness of my stay in Paris enabled me to pay to the Exhibition, and the immense area over which the various articles of interest are spread, I found it expedient to limit my attention to those which might be considered as peculiarly relating to Liverpool commerce.

With regard to the great staple, cotton, I was entirely relieved from the responsibility of reporting, by the close and persevering examination given to every kind exhibited by my colleague, Mr. I. B. Cooke, whose able report, already presented to and highly appreciated by the Association of Cotton Brokers, is herewith laid before you. Cotton.

Next to cotton, the importation of palm oil and the fabrication of soap being more particularly a Liverpool branch of trade, I carefully sought for samples and illustrations of both the raw material and the manipulated articles prepared therefrom. Of palm oil, in its raw state, I found two or three samples, probably imported into Marseilles. It is mentioned also among the productions of Algeria. Of soaps, besides the toilette kinds, in which it is well known France excels, she also exhibited the ordinary palm oil and tallow soap of commerce. Prussia also showed similar specimens. Palm oil and soap.

Specimens of stearine and stearine candles made from tallow, oils, and greases, were exhibited by France, Austria, Prussia, Sweden, Sardinia, Portugal, and a few other countries. The candles of Sweden were conspicuous for their fine, glossy, and well got up appearance; and the tablets of white stearine were very hard, and of great brilliancy. The display of these articles, however, by our own Stearine.

Liverpool Chamber of Commerce.

countrymen, Price and Company, exceeded all others; and in their case was shown also a series of acids used in the process for separating neutral fats. I know not whether it may be new information to the stearine manufacturers of this country, but I learnt from one of the able notices on this class appearing in the *Moniteur*, that a young French chemist had discovered in castor oil (*l'huile ricin*) a sebacic acid, which supplies a desideratum in the manufacture of stearine from fats and tallow by giving a hardness hitherto unattainable.

Woods.

Woods.—Numerous specimens of woods were exhibited by Norway, Sweden, Austria, Algeria, Canada, British Guiana, Australia, and other countries, applicable to the various purposes of ship-building, joiners' work, carpentry, and furniture-making. Many samples are in the form of discs or horizontal sections of the whole tree. The Swedish white pine excelled. Some Austrian specimens of oak were interesting as coming from extensive forests bathed by the river Styr, which falls into the Black Sea, the free navigation of which, with ready access to all its ports, it is to be hoped will now soon develope new elements of trade. Captain Fowke was engaged in a series of experiments for testing the relative strength of the woods suitable for ship-building and carpentry, and would probably extend his experiments to cordage and iron chains, when the consent of the exhibitors could be obtained. He informed me that so far as his trials had enabled him to form conclusions, the woods of British Guiana bore the heaviest strain.

Cordage.

Cordage.—Numerous specimens were exhibited by France, from the smallest marline and cord, to large cables made both from Russian hemp tarred, and from the Manilla, and other hemps known as white cordage. These exceeded in the beauty of the manufacture anything I ever saw. Canvass was exhibited by France, Belgium, Holland, and Great Britain. That of Belgium was rough and inferior; the Dutch better; but the French came nearest to the Dundee fabrics, which on the whole excelled all others.

Iron, cotton, and woollen manufactures.

Illustrations and specimens of iron, cotton, and woollen manufactures were more general throughout the Exhibition, but I cannot pretend to report on them. I would only mention that France and England take the lead, especially in machinery, partly owing, no doubt, to the facilities they possess for sending the weightier specimens to the Exhibition. Prussia and Belgium exhibited in all these departments. All four countries also showed specimens of their coal, which is found in sufficient quantities in the neigh-

Coal.

bourhood of the iron ores to enable it to be used in smelting; an advantage wanting to Sweden, whose native iron, worked chiefly by the heat of charcoal, cannot vie with that of the coal-producing countries in cheapness. LIVERPOOL CHAMBER OF COMMERCE.

There was one two-inch chain manufactured from the celebrated Dunnenrora (Sweden) iron, which was admirably made. I would fain have seen it tested against the English and French chains.

If the specimens shown by France of articles connected with the equipment of vessels are more numerous than those of England, the models of shipping of various classes exhibited by our own country take the lead of every other nation, both in number and importance. Sunderland, as a port, occupies the most conspicuous place; her models, from the fishing boat or coble to the large clipper, are exceedingly well prepared. I noticed also a few models from Liverpool, of which I wish to particularize a very large one of the colossal passenger ship the *James Baines*, showing on one side by vertical section lengthwise the whole arrangement of berths, cabins, &c. Judging by the constant groups assembled round this model, it appeared greatly to attract the curiosity and interest of visitors. Models of ships.

Any notice of the French Exhibition would be incomplete without some allusion to Algeria, belonging to our great neighbour. This department is full of interest, and whether we consider the multitude of its natural productions, and great capabilities, its various soils and temperature, its proximity to the shores of France, or the marked attention paid to the development of its riches by successive French governments, it is impossible not to foresee that this extensive possession is likely to become to France of more importance than all the colonies she ever possessed. Productions of Algeria.

As I am enabled to present to the Chamber, together with the Official Catalogue of the whole Exhibition, a particular one of the Algerian colony, full of interesting details, it is unnecessary for me to do more than to allude to three or four of its chief productions, and of which several specimens were exhibited.

The first is Grain.—When I quote from the above catalogue, that Algeria exported last year to Europe 1,034,000 hectolitres of wheat, 3,727,000 kilogrammes of flour, and 2,697,000 of bread and biscuit, besides quantities of other grain, the greater part of which was sent to the French army in the East, it needs no great stretch of imagination to believe that with a few more years of tranquillity in the Grain.

LIVERPOOL CHAMBER OF COMMERCE.

colony, this part of Africa may again realize its ancient character for boundless fertility, and may contribute largely to the increasing requirements of Europe for cereal supplies.

Cotton.

Concerning Cotton, I gleaned, in addition to the information collected by Mr. Cooke, that the 520 hectares of land under cultivation in 1853 increased in 1854 to 1,720, and that the Algerian cotton is greatly liked by the French manufacturers.

Tobacco.

Many specimens of tobacco were exhibited, both it and the cotton being chiefly from the provinces of Algiers and Oran. Of Algerian woods, three were particularly attractive ;—a celebrated furniture wood called Thuya ; 2, the Olive tree, a specimen of which was exhibited about three feet in diameter ; it also is admirably adapted for cabinet work, though little used in this country ; and, 3, the true Cedar, which is stated to be found in an indigenous state only in this and two other countries in the world.

Minerals.

Of mineral specimens shown, were white marble, gypsum, salt, lead, copper, antimony, iron ; this last is stated to be as well adapted for steel as the celebrated Dunnemora of Sweden.

Other productions.

Among the other more important vegetable productions of Algeria may be mentioned sugar, rice, olive oil, flax, opium, &c.

Silk and cochineal are also easily raised.

Canada and Australia.

The only other countries to which my observations extend, are the British colonies of Canada and Australia. Considering the great distance from which the articles exhibited were brought, both these departments reflect the highest credit on the parties who collected and arranged them, and perhaps no small portion of the success obtained was owing to the excellent plan adopted by the colonists of having a preliminary exhibition last year in their respective capitals.

Canadian productions.

The Canadian Department was, as might have been expected, the most extensive of the two, and I heard in several quarters, that it was the most frequented and popular of the foreign and colonial portion of the exhibition. Perhaps in our day, the great commercial staple of Canada is its woods, and specimens of these were got up in the most admirable manner. Most of them are too well known here to need description. I will only mention, that I counted upwards of twenty different sorts ; but what seemed chiefly to attract attention was some specimens of doors and window frames complete, with the price affixed so low as

evidently to excite the astonishment of the visitors.* The cereal products of Canada also were very numerously represented; several specimens of red and white wheat, oats, and peas, were particularly fine, and the best proof of the appreciation in which all this class of Canadian products was held, was that every specimen, including flour, was marked as "sold." In many manufactured articles Canada compared favourably with Europe. I may mention biscuits, some kinds of harness, furs, refined maple sugar, axe-handles of peculiar form, fire-engines, leather hoses, and some agricultural implements, also a few models of steam-boats adapted for lake and river navigation. With regard to her minerals, specimens of copper and copper ore were shown from the mines on Lakes Huron and Superior, and native copper and iron from sundry localities in Lower Canada, also a few specimens of gold and lead.

LIVERPOOL CHAMBER OF COMMERCE.

Australia.—Judging from the resort of visitors to this department, this colony and its products seemed to excite almost as great an interest as the foregoing; perhaps the frequent attendance of the intelligent commissioner, Mr. M'Arthur, and his ready and interesting explanations, may have added to its attractiveness. This country appears to possess within its continental extent every production, or the capabilities of furnishing them, which the calls of civilized life can demand. Her wools, which were largely represented, need no description here. It would also be waste of time to enlarge on her gold, numerous specimens of nuggets were displayed, as well as of the auriferous earths found in the diggings, the richness of which varied from half an ounce per load to eight ounces. The localities of these earths vary as greatly as of the nuggets, they being, in fact, equally the débris of ancient water-courses; some still near the surface, and others now buried 100 to 200 feet beneath it. Mr. M'Arthur confirmed the conclusions generally drawn from the circumstances of the distribution of these golden treasures, namely, that whilst the search for gold in its pure state, whether as nuggets or in auriferous earths, must ever remain a lottery to the digger, its presence in the rock affords to the scientific miner a more certain, permanent, and probably in the long run a more profitable source of emolument. The mineral department generally

AUSTRALIAN PRODUCTIONS.

* These are remarkable specimens for quality and cheapness. The doors are pannelled, and have moulded jambs. The windows are not hung with lines but open and shut with a catch, and the degree of light may be regulated in the blinds. The makers will execute orders at Montreal at the following prices:—door and framing complete for 19 francs (about 15*s.*); the window, 9 francs; the blinds at 9 francs each. They are made by machinery.

LIVERPOOL CHAMBER OF COMMERCE.

of the Australian exhibition is particularly rich and interesting. Next to the auriferous rocks, and earths, and coal, the samples of her iron and copper, and their respective ores are well worthy of attention.

Wheat.

The samples of wheat from Australia I thought excelled all others that I saw in size, cleanness, and fulness of the grain.

Woods.

The specimens of her woods are highly attractive, and bid fair to yield plentiful supplies for the requirements of the ship-builder, the joiner, and cabinetmaker, as population spreads around the districts where they grow. As Mr. M'Arthur informed me, that it was his intention to reprint the original Australian catalogue, with full details of the articles exhibited, and promised at my request to forward a copy to this Chamber, it is unnecessary for me to enumerate the specimens. I will only advert to three. The first is a white close-grained wood, without knots, the produce of a magnificent pine, found in lats. 35° to 24° S., which grows 120 feet high, with a diameter of 2 to 4 feet near the ground. Its planks are described as of great beauty, and useful for the joiner and cabinet-maker. The next is called, locally, the Black Butt, and grows from 100 to 200 feet high, by 3 to 6 feet diameter, producing a carpenter's wood excellent for ship-building, or any other object where strength and durability are required. The Flindora, another white wood, 150 feet by 4 to 5, is soft on being cut, easily worked, and of great durability. As furniture woods, the beef wood and blood wood, I believe, are already known in this town; but the specimens of woods of great beauty and taking a high polish were numerous, and several articles of furniture made from them in the colony were exhibited. One table alone, of inlaid woods, showed specimens of no less than sixty-four kinds.

Anthracite and coal.

Several samples of anthracite and coal were exhibited, with full particulars of locality, the conditions of the seams, and their properties. The well-known Newcastle coal is described as being applicable to both household and steam purposes; and the price, which, before the gold discoveries, was 9*s.* 6*d.* per ton at the ship's side, had risen during the excitement to 40*s.*, and is now quoted at 15*s.* 6*d.* per ton. Iron is found in proximity with the coal; a providential fact, which seems to foreshadow the important part this magnificent country is destined to take in the future history of the southern hemisphere.

Other productions.

Australia also shows specimens, among many other articles too numerous to be named, of colonial-made soap, preserved meats, native tobacco, cigars and snuff, bees-wax, splendid Indian corn, dripstones, and gutta percha made

from a species of fig. Nor is she to be dependent on the Old World for her wines. Numerous samples of native grown were exhibited; they were described to me by Mr. M'Arthur as both red and white; the former kind has been placed by judges between the Rhone and the Spanish, and the white as approaching Tokay. Those I tasted resembled the wines of Sicily, but as they had been standing in the Exhibition throughout the summer, the condition could scarcely be accepted as a true test of quality. LIVERPOOL CHAMBER OF COMMERCE.

I was obliged, by the shortness of my stay in Paris, to pass by most unwillingly the collections of produce exhibited by our other colonies; but I judge from the Catalogue, which I have since gone carefully over, that Ceylon, Tasmania, Cape of Good Hope, British Guiana, have contributed articles of indigenous and other produce well worthy of attention. Other colonies.

With a few exceptions, no prices or statement of cost were affixed to the samples of either the great staples of raw produce or the manufactures; and in the absence of this important element it becomes impossible to draw practical conclusions for commercial enterprise. Mr. Cole, the British Commissioner, on my stating this matter to him, kindly undertook to endeavour to obtain for the Chamber the cost price of some of the articles I enumerated.* Prices.

REPORT on the COTTON WOOL exhibited as the Produce of different Nations in the PARIS EXHIBITION.

To the Association of Cotton Brokers of Liverpool.

GENTLEMEN,

YOUR Deputy has been enabled to make the special examination with which you have charged him, in some respects, under favourable circumstances. The influence of the Board of Trade, in the Department of Science and Art, was most obligingly exerted to furnish him with effective introductions to the gentlemen who represented the various countries from which cotton was exhibited. These introductions sufficed to procure not only perfect freedom of access, which was of course denied to the public, to the Difficulty in procuring information in spite of the facilities given.

* Several letters have been received in consequence by the Chamber, containing particulars of cost, which the Secretary is engaged in arranging. The last day that I visited the Exhibition, I found a step had been taken in this very direction, by the opening of an economic collection of articles suitable for the use of the humble classes, with the prices affixed. This department promised to be very attractive, and it may lead to the extension of this necessary kind of information to the class of articles which should mainly interest a commercial body like the Chamber.

Liverpool Chamber of Commerce.

samples which it was necessary to examine, but also, in several cases, explanations of new features in the article exhibited, and information, from the best sources, of the powers of production of the countries in question.

Notwithstanding these facilities, the various specimens were scattered so widely, in a most extensive range of buildings, and often so closely hidden amongst a multiplicity of other objects, appointments also were so difficult to arrange, with any regard to economy of time, that this Report will necessarily prove very defective.

Cotton wool.

The article of cotton wool is not, on the whole, very well represented in the Exposition.

United States.

From the United States, the chief source of supply, only a few specimens are shown, and those chiefly of the finer descriptions of Sea Island, one of which was of extremely fine quality. In this article, of which the United States has hitherto had almost the exclusive possession, she is destined, in the future, to find one, and possibly more than one, young and vigorous rival.

Brazil.

From Brazil not a single sample appeared.

Egypt.

The Commissioner from Egypt most willingly made an appointment with your Deputy, and showed him various parcels, contributed both by the Egyptian Government and from private sources, which, however, did not differ materially from the good and fair qualities which the Trade have constantly before them in Liverpool. The Commissioner explained that a trade was springing up in oil, which, in Egypt, was expressed from the seed of the cotton plant. This oil, in its grosser forms, is used as a substitute for tar, and, in different stages of purification, for illumination, lubrication, soap-making, and, in its purest form, for human food. Each quality is exposed along with the samples of cotton. It was the opinion of the Commissioner that this additional produce from the same plant would serve eventually to cheapen the production of the staple.

East Indies.

Dr. Royle, who presides over the display of the produce of British India in the Exposition, and who, from his connexion with the East India Company, his personal knowledge of the climates and soils of India, and of all the experiments instituted by the Company for the improvement of cotton, is probably the person of all others best competent to give information on the subject, most obligingly gave his assistance in the examination of this department. He does not, however, appear to be very hopeful of the result of any attempts to improve the character of Indian cotton, except to the extent yielded by the specimens of Dharwar cotton

lately sent to England. He also gives expectation that the opening of the extensive Berar district, by railway, to the Bombay side, and by improvement of the navigation of the Godavery river on the east coast, may furnish us with an article more nearly approaching to the American staple than any which has hitherto been permanently imported from India. LIVERPOOL CHAMBER OF COMMERCE.

The several colonies of New South Wales are represented by Mr. M'Arthur, who, after long residence and travelling in that country, is perfectly acquainted with all its varied products. With great politeness, this gentleman devoted a whole morning to promote the objects of your mission. He exhibited several samples of cotton the production of land in the neighbourhood of Moreton Bay, and some also from the interior in the same latitude, about 27° South, which were all from Sea Island seed, but cultivated without much care. Those from the coast, especially, are very favourable specimens as to length and fineness, but are defective in point of clearness of staple, which Mr. M'Arthur attributed to the want of care in the cultivation. He asserts that in this wonderful country there is an enormous extent of territory on the east coast perfectly suited to the production of our commodity, and only waiting the labour which, were it not for legislative enactments unequally distinguishing this dependency from the other British colonies, would not be difficult to procure. The prohibition of the importation of Coolies, which to all our other colonies has been reduced to such restrictions as are required by humanity, continues, apparently by oversight, in full force in Australia, and forms, according to Mr. M'Arthur, the chief impediment to a large production of cotton. New South Wales.

After several vain attempts, both by personal calls and correspondence, to obtain an interview with the gentleman who was entrusted with the products from the Cape of Good Hope, Island of Ceylon, and several of our West Indian colonies, it is necessary to pass over in silence the few specimens exposed from these localities, which, however, did not appear to present any new features. Other colonies.

Several samples are exhibited from Greece, and several from Mexico, on which no particular information has been obtained. None were shown from Carthagena or Demerara and Surinam. Greece and Mexico.

The only other source of cotton is the French colony in Algeria, and great pains have been taken to render the exposition of the produce of this territory as perfect as possible. M. de Bouville, a gentleman practically acquainted with the cultivation of cotton in Algeria, and acting in the Algeria.

LIVERPOOL CHAMBER OF COMMERCE.

Exposition under the immediate authority of the Minister of War, was, in conjunction with Mr. M'Arthur above mentioned, the intelligent guide and informant in reference to

Algeria.

the large accumulation of samples of Algerian cotton. In this fifth year of the growth of the article in the colony there are no fewer than 150 exhibitors of their produce, and upwards of 250 samples, chiefly of Sea Island cotton. During last year 1,800 bales were exported to France, and this year 9,000 acres are under cotton cultivation. The soil all along the coast, and in some parts for upwards of 200 miles into the interior, is represented to be of the siliceous and salty description, which exactly suits the nature of the Sea Island plant. A full production is yielded to the acre; and whereas in America it is not profitable to cultivate except as an annual, in Algeria the produce is greater the second year than the first. A specimen of some which has been spun into yarn, by Messrs. Gardner and Bazley, the yarn and cotton being exhibited together, is nearly, if not quite, equal to the finest produced in the United States. A few favourable samples of Louisiana and other kinds of cotton are also shown, but the character of the soil, especially in the province of Oran, as well as the genius of the cultivators, appear to lead to the selection of the longer staple and best quality rather than to the production of large quantity of an inferior article. An important company, with large capital, on the principle of limited liability, has been formed to promote the cultivation; and a judicious prize is awarded by the Emperor to the estate producing the largest quantity in the year.

Conclusion.

It may not be out of place, in conclusion, to offer a willing and grateful testimony to the courtesy and consideration which was awarded by both the French and English authorities connected with the Exposition, to the representative of a Commercial Association from Liverpool. Every assistance and facility were afforded by them which could in any way promote the purposes of the mission.

I am, &c.

ISAAC B. COOKE,

President of the Cotton Brokers' Association.

Liverpool, 21st September 1855.

REPORTS

OF

JURORS AND OTHERS,

ON THE

VARIOUS CLASSES OF THE EXHIBITION.

On AGRICULTURAL IMPLEMENTS and PRODUCE, by J. EVELYN DENISON, M.P., VICE-PRESIDENT of the JURY for CLASS III. AGRICULTURE.

To the Right Hon. the Lord Stanley of Alderley, President of the Board of Trade, &c.

MY LORD,

THE International Jury of Agriculture (Class III.) of the Paris Exhibition consisted of,— Members of Jury.

Count de Gasparin, President	France.
Evelyn Denison, Vice-President	England.
Count Hervé de Kergorlay, Secretary	France.
Boussingault	France.
Barral	France.
Yvart	France.
Dailly	France.
Vilmorin (Louis)	France.
Monny de Mornay	France.
Robinet	France.
Delehaye	Belgium.
De Mathelin (Léopold)	Belgium.
Ramon de la Sagra	Spain.
Dietz	Grand Duchy of Baden.
Baron de Riese Stallbourg	Austria.
Dr. Arenstein	Austria.
Baron Delong	Denmark.
Wilson, J.	England.
Amos, C. E.	England.
Nathorst, J. T.	Sweden and Norway.

It was quite time that France and England should be better known to each other, and that it should be made apparent what great benefits would accrue to both countries from an improved acquaintance and extended intercourse.

Mr. Denison on Agricultural Implements, &c.

French opinion respecting agriculture in England.

Up to the year 1851, till the time of the Exhibition of London, we are told by a French writer of high authority,* "that in France, more perhaps than elsewhere, notwithstanding our near proximity, an opinion had prevailed that in England agriculture had been neglected in favour of trade and commerce. The tariff regulations of Sir R. Peel, not well understood in their design or in their consequences, had tended to fortify this assumption. Nothing, therefore, created more surprise than the vast collection of agricultural implements which the Exhibition of London contained, and the proof they afforded of the high development of agricultural skill and science in the United Kingdom."

It has been reserved for the Paris Exhibition of 1855 to give new force to these impressions; to carry into the heart of France, and to display before the eyes of hundreds of thousands of spectators, these evidences of the skill of our machine-makers, placed in immediate contrast with the works of their competitors from all quarters of the world.

Result of th Exhibition

The approach between the two nations, which was invited by the Exhibition of 1851, has been advanced and quickened by the Exhibition of 1855. The cordial and friendly reception given to Englishmen of all classes in Paris has been thoroughly appreciated and responded to,—new interests have been called into action. The advantages to be derived by both people from a more free communication have forced themselves upon public attention, and have taken root in public opinion. Such a result alone would be worth all the labour and all the cost of both Exhibitions.

Subjects reported on.

It was not till the 25th of October, shortly before the close of the Exhibition, that I was made acquainted with your Lordship's wish, that I should furnish a report on the Class of Agriculture. If I had known this wish at an earlier period, some matters, especially matters of detail, might have been noted, which it would not be easy now to go back upon. But I bear in mind that this is not a report, accompanying and justifying an adjudication of prizes. Such a report will be furnished to the Imperial Commission

* M. Leonce de Lavergne, author of "Essai sur l'Economie Rurale de l'Angleterre, de l'Ecosse, et d'Irlande." This essay formed part of a course of lectures delivered at the "Institut National Agronomique." The information it contains, as regards the condition and prospects of agriculture in these islands, is so correct, and exhibits such a thorough knowledge of the subject in all its branches, that it is a reasonable assumption, that a writer who writes so accurately about the affairs of a foreign country, may be relied upon when treating of his own. This essay has gone through two editions in France, has been translated into English, and has undergone the ordeal of Scotch criticism.

by officers specially appointed in each class, and will be accessible to all.

The terms of the letter addressed to me by your Lordship's directions are, "That I would furnish a report, to be laid before Parliament, of the position which the United Kingdom held in the Paris Exhibition, compared with foreign countries, in the Class of Agriculture, and the progress, if any, which has been made since 1851 in respect of this class of objects."

I propose to follow the course pointed out in this letter of instructions.

Position of France and England, as regards agriculture.

It may be well to consider at the outset the position of the two countries as regards agricultural practice at the present moment. Such a picture, full of life and interest, has been drawn to our hands by the able pen to which I have already referred. As the comparison is very favourable to this country, I prefer to employ the words of a French author, rather than to make use of my own.

In natural gifts of soil and of climate, the advantages are beyond all question on the side of France. It may be that France has relied too much on these excellent gifts, while England, less favoured, has been urged by her necessities to increased exertions.

Systems of Cultivation.

Different systems pursued in France and in England.

"France has devoted herself too exclusively to the production of corn crops, which are the immediate food of man, without sufficiently considering the means necessary to uphold the fertility of the soil under this exhausting process. England, on the contrary, has been led, partly by the nature of the climate, partly by design, to take a sort of by-path, which reaches corn crops through the intervention of green crops; finding, in the rearing of cattle and the supply of manure, the restorative process which is necessary.

Success of the English plan.

"The experiment has entirely succeeded, and is extending itself day by day; and the remarkable fact is, that in proportion as the head of cattle increases, the quantity of corn increases also; the gain in intensity exceeds the loss in extent. Thus, on a surface of 31,000,000 of hectares, reduced to 20,000,000 by the waste lands, the British isles produce more food for animals than the entire surface of France, of double the extent.* Hence, the supply of manure is in pro-

* I preserve the French measures, together with the calculations of the author. French hectare is equal to 2·471 English acres.

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portion three or four times greater. The average produce per hectare in France is 6 hectolitres of wheat, about 5 of rye, and 1 of maize or buckwheat, — collectively about 11 hectolitres. In England, 25 hectolitres of wheat ($3\frac{1}{2}$ quarters per acre), more than double in quantity, and three times more in saleable value. Scotland and Ireland are included in this estimate. If the comparison is made with England alone, the results are far more striking. This little country, not larger than one fourth of France, produces 38,000,000 of hectolitres of wheat, 16,000,000 of barley, 34,000,000 of oats. If France produced as much in proportion, she would produce, deducting seed, 150,000,000 hectolitres of wheat, 200,000,000 of oats and other grains; that is, at least double her actual production.

"Taking all products into account, animal and vegetable, it appears that the produce of England per hectare, nearly doubles that of France.

Relation of animal and vegetable products.

"The great lesson which these figures teach, beyond the disproportion of the results, is the relation of vegetable to animal products. In France the vegetable products form four-sixths of the whole, and the animal products two-sixths only; showing at first sight an exhausting cultivation, and one at least stationary. In the United Kingdom, the animal products are equal to the vegetable. Thus the animal products alone of an English farm are equal to the entire products, animal and vegetable, of a French farm of the same extent.

Sheep.

Sheep;

"The most remarkable feature of British farming, in comparison with that of France, is the number and quality of the sheep. According to the statistical returns and estimates, the number of sheep in France and in England is about equal, about 35,000,000 of sheep in France, and 35,000,000 in England. But this apparent equality conceals an inequality the most marked. 35,000,000 of sheep in the United Kingdom live on 31,000,000 hectares of land. 35,000,000 of sheep in France live on 53,000,000 hectares. France, in order to have as many sheep in proportion as the United Kingdom, ought to have 60,000,000. If the comparison is made with England alone, the difference is far greater. England feeds 30,000,000 of sheep on 15,000,000 hectares of land; that is, proportionally, three times as many as France.

their quality.

"But the great difference is in the quality of the sheep, upon the breeding and improving of which, with a view to

weight and early maturity, so much care and attention has been bestowed. The weight of an English sheep is twice that of a French sheep. So that an English farm on an equal surface gives six times as much mutton as a French farm.

Horned Cattle.

Horned cattle; "In the case of cattle, the same care in breeding from selected animals in the United Kingdom, and continually improving the races, in studying meat-producing qualities and early maturity, has effected results similar to the results produced in sheep. France possesses 10,000,000 head of cattle, the United Kingdom 8,000,000. In France, three products are demanded from cattle,—labour, milk, and meat. In England, only two,—milk and meat. The yield of these two valuable productions is materially interfered with by requiring work also from cattle. It might appear, at first sight, that the work of cattle could not in an important degree influence the supply of meat, and it is not difficult for people to persuade themselves, that labour in utilising the life of an ox enables meat to be sold at a lower price. But experience has proved, that if this is sometimes a truth in detail, it is an error in the gross.

their labour; "The habit of labour forms hardy, vigorous races, which, like men devoted to hard work, eat much, fatten slowly, develop their bony structure, make little flesh, and make it slowly. The habit of inaction, on the contrary, forms races, gentle, tranquil, which fatten early, assume round and fleshy forms, and give with equal food a far larger yield to the butcher. If we look to labour, the ox is killed when he has finished his task. If we look to meat, the ox is killed at the moment when he yields the largest amount. Cattle, in France, are killed too young or too old; among the 4,000,000 head killed, figure 2,000,000 calves, giving each only 30 kilogrammes of meat. Those which survive are killed at an age when the growth has long ceased, *i.e.*, when the animal has long been consuming nourishment which has not added to his weight.

their meat. "In England, on the contrary, animals are killed neither so young, because in their youth they make the most meat, nor so old, because then they make none. The moment is seized when the animal has reached his maximum of increase.

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"In France, the number of animals killed annually is about 4,000,000 head, producing 400,000,000 kilogrammes of meat, averaging therefore 100 kilogrammes per head.

"In the United Kingdom, the number killed is 2,000,000, producing 500,000,000 kilogrammes of meat, averaging 250 kilogrammes per head.

"Thus, with 8,000,000 head of cattle and 30,000,000 hectares of land, British agriculture produces 500,000,000 kilogrammes of meat; while France, with 10,000,000 head of cattle, and 53,000,000 hectares of land, produces only 400,000,000 kilogrammes."

Agricultural show at Paris.

Such a description of the high attainments of English agriculture having been placed before the public of France, it was natural that great expectations should have been formed, both as to the display of live stock and the exhibition of agricultural implements. Nor, I venture to say, were these expectations disappointed. The cattle of our improved breeds found a crowd of admirers, and many purchasers.

Durham short-horns.

The Durham short-horns have been imported largely into France for some years by the agents of the French Government, and very good specimens of this race, bred in France, were exhibited. The first prize, for young bulls of the Durham breed, was awarded to the Marquis de Talhoust, for a bull sixteen months old.

South Down sheep.

More surprise was created by our sheep, especially by the large size and admirable symmetry of our South Downs. The jury decided that a gold medal of the first class should be struck in the name of Mr. Jonas Webb, for the collection of South Down sheep, bred and exhibited by himself.

The cattle Show took place before the juries for the Palace of Industry were summoned to Paris; I had not the good fortune myself to see the show.

Foreign breeds.

The deputation who accompanied the President of the Royal English Agricultural Society were greatly pleased with the excellent arrangements of the show, and with some of the continental breeds of cattle, especially with the French Charolais race, as very good in themselves, and offering a stock very suitable for crossing with short-horn bulls; also with the Métis-merino sheep, pointing out the road which French breeders must pursue to accomplish the end of their mission,—the supply of meat at a reasonable price to the markets of France. Though horses formed no part of the show, I must not omit to mention the race of draught horses, known by the name of Percheron. They are strong, muscular, hardy horses, of great power and activity, worthy the attention of English

breeders, better suited for the quickened step of improved farming than the heavier sort of English cart horse. MR. DENISON ON AGRICULTURAL IMPLEMENTS, &c.

The collection of agricultural implements was formed by Mr. Brandreth Gibbs, under the direction of the Board of Trade, assisted by a committee of the English Agricultural Society. The selection was made with great judgment; the implements sent were not too numerous, and they were all of established excellence. They consisted of ploughs, harrows, cultivators, broadshares, drills, horse-hoes, rakes, rollers, reaping machines, haymakers, &c., portable steam-engines, threshing machines, chaff cutters, corn crushers, and machines for making draining tiles. But the French system of classification placed in the list of agricultural implements those implements only which are used in the fields. It removed the articles last on the list, threshing machines, chaff cutters, corn crushers, machines for making draining tiles, from the jury of agriculture, and placed them in Class VI., "Mécanique spéciale." This led to some practical inconvenience in the conduct of the trials, and to a seeming inconsistency, connected with the change made in the tariff of duties, of which I shall presently speak. Agricultural implements.

The first trial of implements took place on the 7th of July, at Trappes, about ten miles beyond Versailles, on the farm of M. Dailly, a member of the jury, who afforded every possible accommodation and the most liberal hospitality both to the exhibitors and the members of the jury. Trial of implements

The day was chiefly devoted to the trial of ploughs; an English hay-maker was exhibited, and tried on newly mown lucern. In England it is employed generally only for meadow grass, for which it is best suited. Though a machine of very long standing in this country, it appeared to be a novelty in France, and was much admired and approved.

Subjoined is the report of the experiment on ploughs, furnished by Mr. Amos, my colleague, consulting engineer of the English Agricultural Society, who assisted at the trials.

Experiments on Ploughs.

Trappes, July 7th, 1855.

Fifteen were used from various countries. A great difficulty was experienced in obtaining the names and addresses of the exhibitors, through the cards or marks not being Report on the Trial of Ploughs.

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Report on the Trial of Ploughs.

placed on them. This accounts for the imperfection of the first column, viz., "Makers' Names."

The land was light, and offered but little resistance to well-made ploughs, but the experiments would have been more valuable had more "field room" been given, so that each plough could have made three or four turns before the dynamometer was applied. Each plough should also have worked to *the same depth*, as the ground was harder at bottom.

The "ground" is also usually harder near the old "water furrow," and lighter near the old "ridge;" hence each plough should have had a "land" or "ridge" to itself, and then, had the dynamometer been applied at an equal distance from the old "furrow," greater truth would have been obtained.

Dynamometers.

The dynamometers tried were one provided by the French, one from Denmark, and one from England (by Bentall). The latter was used, but it is imperfect when used with ploughs of "light draught," as it gives the "resistance" of such ploughs too small. This arises from the driving "disc plate" having a hole in its centre, and although that hole is of no consequence or inconvenience when ploughs are used on "heavy land," yet when used with ploughs of small resistance on "light lands" the spring of the dynamometer is not compressed enough to keep the "driving disc" clear of the hole; hence the "registration" is too small with light ploughs. This may account in degree for the difference (*as recorded*) in the draught of the ploughs of our best makers.

Results of the experiments.

The following table gives the length, breadth, and depth of "earth removed," which, being multiplied together, gives a "total" in cubic feet. The tabular number in the seventh column is the number recorded by the dynamometer. This number in each case multiplied by 100, and the product divided by the number of cubic feet of earth removed in each experiment, gives the tabular numbers in the eighth column. The numbers in the eighth column show the "*comparative cost*" or "*expenditure of power*" of removing an equal quantity of land, the *lower number* showing the *greater degree of excellence* of the implement.

In carrying out the details of the experiments, the able assistance rendered me by Mr. Edward Combes, C.E., of Paris (a gentleman recommended by Professor Wilson), was eminently useful.

C. E. Amos.

Experiments on Ploughs at Trappe, near Versailles. July 7th, 1855.

No. of Trial.	1. Maker's Name.	2. Country.	3. Mean Breadth.		4. Mean Depth.		5. Length in Feet.	6. Quantity of Earth in Cubic Feet.	7. Dynamometer.	8. Comparative Resistance.	9. Remarks.
			Centimes.	In.	Centimes.	In.					
1	Florian Maurer	Duchy of Baden	·25	9·84	·16	6·20	1,444	611	—	—	—
2	Busby	England	·25	9·84	·17	6·70	1,444	661	42	6·3	Made excellent work.
3	Barrosch and Jasper	Austria	·27	10·63	·175	6·90	1,444	735	—	—	Called the "Geometrical Plough." This was so badly managed, and its coulter arrangements so imperfect, that the experiment could not be finished.
4	Berckman	Belgium	·23	9·00	·17	6·70	1,444	604	43	7·1	Rough work.
5	The "Brie" Plough		·28	11·00	·12	4·74	1,444	522	—	—	Furrow not well turned.
6	The "Toronto"	Canada	·20	7·87	·19	7·48	1,444	590	45·5	7·7	Worked very well.
7	The "Grignon"		·25	9·84	·17	6·70	1,444	661	29	4·4	Good work.
8	Jos. Tixon	Belgium	·25	9·84	·18	7·10	1,444	700	42	6·0	The land side left extremely rough.
9	Howard	England	·23	9·00	·175	6·90	1,444	622	16	2·6	Very good. Draught, very light.
10	Barrosch and Jasper	Austria	·25	9·84	·16	6·20	1,444	611	62	10·1	Without a coulter; the mould board set very obtuse, and the land side very rough. Called the "Ruchadlo."
11	Ball	England	·22	8·66	·19	7·48	1,444	650	22·5	3·4	Very good.
12	The "Thaer" Plough	Saxony	·24	9·44	·18	7·10	1,805	840	·136	16·2	Mould board set very obtuse, causing an excessive resistance.
13	Ransom and May	England	·23	9·00	·18	7·10	1,805	801	50	6·2	Work very well done, land rather harder.
14	J. M. Odeurs	Belgium	·26	10·23	·165	6·50	1,895	833	57	6·8	Worked well, the land well turned over and pulverised.
15	The "Toronto" Iron Plough.	Canada	·22	8·66	·20	7·87	1,805	854	72	8·4	Very good.

C. E. A.

Mr. Denison on Agricultural Implements, &c.

The trials, for the reasons above-mentioned, could not be considered entirely complete or satisfactory. The indications of the dynamometer were unduly favourable to the ploughs of the lightest draught, but making the fullest allowance for this, the difference between the resistance offered by the different ploughs will appear very remarkable.

The best French plough, the "Grignon," was light, cheap, simple in construction, and did very good work, but in comparison with Howard's plough, the dynamometer marked 29 as against 16, in comparison with the best Belgian plough "Odeur," 57 as against 16.*

Objections to English machines.

It was objected against the English ploughs, and indeed against the English machines in general, that they were too heavy and too costly, but the trials showed that a light plough does not always make light work, nor is an implement, cheap at first cost, always the cheapest in the end. The same objections against iron ploughs, and in favour of the old wooden ones, have been freely made at home, but they are passing away under a longer experience. To do good work in the field you must have strong and well constructed implements. The best implements are the cheapest in the end, they are fast superseding inferior machines at home, and they will no doubt in time obtain the same preference, wherever they shall be put fairly to the test.† The value of solidity and strength was fully recognized in the implements akin to ploughs, drags, scarifiers, and broadshares, by which so much of the labour on the best cultivated farms is now effected. The implements by Garret, Bentall, and Coleman were the first of their class, and their superiority was not contested.

Position of English exhibitors.

The position of the English exhibitors of agricultural implements was not an encouraging one. They sent specimens of their newest inventions, and most approved machinery. These might be examined, copied, purchased as models, by foreign competitors. The individual machines exhibited might, indeed be sold at the close of the Exhibition, on the payment of a duty of 20 per cent., *ad valorem*. But the sale of a single machine was, of course, a most inadequate compensation for the trouble and expense incident upon the Exhibition; nothing more, however, was in view. The

* Further trials on the 1st and 2nd of August, and on the 14th and 15th of August, made with the dynamometer of General Morin varied in some degree these results. They were made in the absence of the English makers and their workmen. They were favourable to the light draught of the Grignon plough.

† Howard's plough was bought on the ground for the Government Establishment at Grignon.

duty on the importation of machinery was so high, that it amounted to a prohibition. It was not to be expected, under such circumstances, that any great zeal or enthusiasm should prevail among the English machine-makers, busy at that moment in preparation for the Carlisle show. Still, when notice was given of the intended trials at Trappes, at a few days' warning only, several of the makers themselves came over, bringing with them their workmen, and they appeared on the ground ready to contend for the honour of victory, though victory should be barren of all but honour. At the close of the day their conduct through the trials drew from Count de Gasparin, the President, these complimentary words:—"Your countrymen have, indeed, set an example to all. They have brought good implements, men to manage them, an interpreter to speak for them, an engineer to advise with. This is the way in which business should be done."

Reduction of the duty.

An international exhibition, which had broken down no barriers of prejudices or partial laws, which had ended without exciting friendly sympathies, or promoting friendly intercourse, would have been but a barren display. The enlightened Frenchmen, with whom I had the good fortune to be associated, were the first to pronounce in favour of free exchange. Our class agreed unanimously to make a representation to the Imperial Government in favour of a reduction of the duty on foreign agricultural machinery. The representation was successful: an Imperial Decree appeared in the *Moniteur* of September 7, making a considerable reduction in the duty on many manufactured articles, and specially reducing the duty on agricultural machinery to 15f. per 100 kilogrammes. This duty being by weight, 15f. per 100 kilogrammes (equal to 2 cwt.) operates unequally in different classes of machinery.

On an iron plough, for instance, in which the weight of the raw material, in comparison to workmanship, is considerable, the duty will be something above 20 per cent., *ad valorem*. In the more complicated machines, in which labour enters more largely, as in drills, horse-hoes, &c., &c., the duty will be from 15 to 20 per cent., *ad valorem*.

This concession was accepted with much satisfaction by our machine-makers; orders to some extent were received for machines. The barrier, at all events, which had hitherto stood between the industry of the two countries was broken down, and ground was laid for a trade, which may be ripened and matured into results of mutual benefit to both countries.

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I have said that portable steam-engines, and threshing machines, and tile-making machines were not included in the list of agricultural implements.

Duty on threshing and tile-making machines was not reduced.

Unfortunately the classification in the books of the Custom-house corresponds with the classification in the catalogue of the Exhibition, consequently those machines, not falling under the denomination of agricultural machines, do not partake of this reduction of duty.

Of all machines connected with agriculture, there are none in which greater improvements have been made in late years than in machines for making pipe tiles for draining. There is no class of machinery which would be more useful in France. The excellent results of draining are there thoroughly understood and appreciated. Specimens of draining were exhibited by the Marquis de Bryas (Gironde) and the Viscount de Rougé (Aisne) from the opposite extremities of France.

Advantage derived from draining.

The draining of the Medoc vineyards by Count Duchâtel has been attended with complete success. It is computed that one-seventh of the surface of France requires draining. It is understood now that draining not only keeps land drier during the rains of winter, but keeps it cooler and more moist during the heats of summer, preventing the baking of the surface by the sun, and promoting the constant progress of vegetation. It is the foundation of all improvements,—the first step in the path of good cultivation. No machines attracted so much attention as the tile machines of Messrs. Clayton and Whitehead, exhibited in work. They were surrounded, from morning to night, by a crowd of spectators. I cannot think it probable that the Government of France, anxious to promote improvements, and to strengthen the hands of French agriculture, will decline the benefit which is offered to them by the possession of these approved machines.

Cost of importing a tile machine into France.

Under the law, as it at present stands, the cost of introducing a tile machine into France exceeds the prime cost of the machine. Mr. Clayton thus reports his experience :—

"The sale of tile machines for France would have been much greater, but the numerous applicants were deterred by the high rate of duty ; it amounts, indeed, almost to a prohibition. I sold, the other day, a tile machine and pug mill, to be delivered at Fresnes, near Paris. The sale value of this machinery amounted to 58*l.*; the cost for transport and Douane charges amounted to 62*l.*—4*l.* more than the entire cost of the machinery."

The threshing machines were tried by the jury of Class VI. The English machine by Hornsby, and the American by Pitts, of Buffalo, State of New York, were the most approved. The details of the trials have not yet been published, and they are not in my possession. Mr. Denison on Agricultural Implements, &c.

These trials do not appear to have been conducted with all the care and exactness necessary to place the decisions beyond the reach of cavil.

Reaping Machines.

Though reaping machines have, up to this time, disappointed the sanguine expectations which were formed of them at their first appearance, the various specimens in the Exhibition were regarded with much curiosity, and the trials of them excited a lively interest. Mr. W. Fairbairn, President of Class VI., has favoured me with the following report on these machines. The name of Mr. Fairbairn will be a sufficient warrant for the value of this report. Reaping machines.

Report on Reaping Machines.

Machines of this kind are of great antiquity. They were known to the Romans, but we hear nothing of them during the middle ages; and from those remote times we have few traces of improvement, or any successful attempts to substitute machine-reaping for the sickle. It was reserved for Mr. Bell, of the Carse of Gowrie, in Scotland, in 1826, to construct a machine that answered all the purposes of a good reaper. Mr. Bell has used his machine, and gathered his harvest by it, for the last twenty-nine years, and it is not too much to say that most of the machines now in use are based upon the principle of Bell. There is great similarity in nearly the whole of these machines, and the Universal Exhibition of Paris exhibits nearly the same characteristics in principle and construction as those shown at the Exhibition of 1851. It is true there are some slight improvements introduced by Mr. M'Cormick and others, but the principle of the machine remains unaltered, excepting only the receiving boards, which in those brought forward for competition at the Paris Exhibition are exceedingly variable, and some of them very ingenious. Report of Mr. Fairbairn on reaping machines

The period of the General Exhibition at Paris was most favourable for giving a fair trial to machines of this description, and the month of August afforded an excellent opportunity for testing the merits of each machine by actual experiment. Through the liberality of M. Dailly, a distinguished agriculturist, and member of the jury, a field of oats Trial of the machines.

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Trial of the machines.

on his farm at Trappe was set apart for the exclusive purpose of ascertaining the properties and proving the value of each machine. The Imperial Government, always alive to the interests of the community and the advancement of mechanical art, took a deep interest in the trials, and in order that the jury might not be incommoded, several mounted gens d'armes, a few soldiers of the line, and a drummer, were sent forward to Trappes to prevent the crowd from inconveniencing them. On the 2nd August, at 11 o'clock, the machines were divided into three groups, and the contest for superiority commenced as follows :

	Metres.
Group 1st,—	
M. Cournier's allotment . .	1,628
M. Atkins' „ . .	1,733
M. Lawrent's „ . .	1,825
Group 2nd,—	
M. Mazier's „ . .	1,826
M. Manny's „ . .	1,900
M. Crosskill's „ . .	1,958
Group 3rd,—	
M. M'Cormick's „ . .	1,987
M. Dray's „ . .	2,256
Canadian „ . .	1,650

Having grouped the machines as above, the conditions were, as far as I could learn,—the time required to cut the allotment, the number of hands employed, and the perfection with which the work was executed without injury to the grain. These conditions being ascertained, the first group commenced operations, by beat of drum, at 11 o'clock, all three starting at the same time.

Group 1.

Cournier's machine.

Cournier's Machine (French) on Bell's principle.—This machine, with one horse, cuts clean, but is liable to get entangled in the cutters with straw. A great deal of time was lost from this cause, and this defect appears to be common to all the machines when the speed happens to be reduced under two miles and a half an hour. In this respect I found the maximum velocity of the machines to be as nearly as possible three miles an hour, and the knives for every eighteen feet in distance made eleven single or twenty-two double cuts for one revolution of the wheel. This machine had a sliding rake motion for the convenience of

the reaper, and in order to enable him to clear the receiving-board of the grain as it is cut. With some improvements, this machine may be made much more effective, and would work much better with two horses and a wider cutting board, so as to take a greater width of grain, and maintain the speed necessary to accomplish a maximum result. From the frequent clogging of the cutters it required sixty-seven minutes to cut 1,628 square metres of corn. The reel in this machine for gathering the corn went too fast, and proved injurious by striking the grain too high up the stalk.

Atkins' machine.

M. Atkins' Automaton Machine (American) executed 1,733 square metres in twenty-four minutes. This machine is nearly self-acting, and only requires the driver; one attendant, indeed, following the machine in case anything goes wrong. Its novelty consists in a rake worked from the wheel that drives the cutter shaft. It is attached by an arm or connecting rod to the bevel wheel, and by a combination of levers it receives a rotatory motion, which, along with that in a longitudinal direction, drags the grain forward over the side of the board. In order, however, to make sure of the discharge, another rake or cleaner strips the before-mentioned one of its load, and lays the straw in parallel lines ready to be bound into sheaves. This machine, like Cournier's, has some clever devices about it; but like all new attempts at improvements, there still remains some further improvements to simplify and make the machine more effective and complete.

Lawrent's machine.

Lawrent (French).—This machine, like Cournier's, was constantly choking with the straw round the cutters. It is a copy of Bell's, and requires two men at the pole, a driver and a reaper, to work it. It is a heavy machine, and almost too much for two horses to work, and the reason of its entanglement was a falling off in the speed. In all these machines speed is an element of success, as might be seen whenever the velocity of the knives and the speed of the machine were reduced; on such occasions, choking or entanglement of the straw was the result. This being the case, it is therefore a consideration of much importance to have all these machines of such dimensions as to enable the horses to work them with ease at the required velocity.

Group. 2.

Mazier's machine.

Mazier's Machine (French).—This machine is of light construction, adapted for one horse, and cuts a breadth of two feet seven inches in line all round the field. It cuts

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either right or left, by means of the frame containing the cutters turning on a central axis. The knives are worked by a wheel and worm, and are well calculated for cutting light grain, such as oats and barley, but might prove inefficient in operation on a field of heavy wheat. The machine, as a whole, was rather slender for the work it had to perform, but if well constructed, and the parts judiciously proportioned for two horses, there is no reason why it should not reap any description of grain. In the attempt to cut the allotment it unfortunately broke down by some of the parts giving way.

Manny's machine.

J. M. Manny (United States).—Mr. Manny's allotment consisted of 1,900 square metres, which he cut in twenty-six minutes. The machine is worked by two horses, and cuts a breadth of four feet six inches. Mr. M. speaks highly of his machine, and gives numerous testimonials of its efficiency, exclusively of medals, premiums, and awards from different districts in America, and from different countries in Europe, for its performance. According to Mr. Manny's account, "it will cut either grass or corn when down, wet or dry, and in whatever direction the wind blows, without being stopped for a single instant." Mr. M. further observes, "that it can easily be converted, in a few seconds, from a reaper into a mower, and the only thing required is to withdraw the platform, and change the scythe of the reaper for the cutting scythe of the mower. The cutting apparatus, for corn or for grass, is made in such a way that it cuts as well backwards as forwards when the machine is reaping; the wheat is received on the platform, gathered, and put into a heap by the action of a wing-board, and by a single stroke of his rake the attendant puts down on the ground at the back of the machine the already made sheaves, which only require tying." It will not be necessary to follow Mr. Manny further in his description, which evinces great confidence in the superior performance of the machine; suffice it to observe, that it did its work, with the exception of some parts not very clean cut, moderately well, and in twenty-six minutes completed the quantity it had to perform.

Crosskill's machine.

Crosskill's Machine (English) is an improvement upon Bell's, and in great repute amongst the farmers of the North Riding of Yorkshire and other parts of England. In the hands of Crosskill it has received several improvements, but unfortunately, on this occasion, the key of the connecting rod that works the knives got loose, dropped out, and stopped the process of reaping. Under these circumstances

it was thought desirable to withdraw the machine, and leave the field open to the other competitors.

GROUP 3.

M'Cormick's machine.

M'Cormick (American).—This reaper is probably one of the best machines of its class. It reaped 1,987 square metres in seventeen minutes, and judging not only from the quantity of work done in so short a time, but from the manner in which the ground was cleared, and the grain cut, it evidenced much greater perfection in its operations than any of the others whose powers were brought to the test. It cuts a clean track of five feet six inches wide, and performs the operations with a degree of certainty and precision sufficient to account for the very short time in which the allotment was cut down. This machine, like most others, is susceptible of still further improvements, and I am glad to find that Messrs. Burgess and Key, the makers, are about to introduce a new moveable apparatus, consisting of three Archimedean screws, for delivering the grain from off the receiving board as it is cut. The great defect of this machine was the imperfect way in which the grain was delivered from the platform after being cut, and the evident want of some method of laying the heads and straw parallel and in bundles and sheaves, and also for clearing the ground and leaving the track clear for the horses on the return cut. This defect in distributing the cut grain as it falls from the knives appears to be the principal objection to this machine. Burgess and Key's clearing apparatus, if properly constructed, may probably remedy this evil, and render the machine much more perfect in its operations than it has been heretofore.*

Dray & Co.'s machine.

W. M. Dray and Co.'s Machine (English) is of an exceeding compact form. It is entirely without a reel for gathering in the corn to the cutters, and requires only one man as a reaper to watch the cutters and discharge the corn as it is received upon the board or wooden platform behind. The cutters are five feet wide, and it reaped 2,250 square metres in 35 minutes.† The peculiar features of this machine are, its portable construction and the receiving-board, which

* A trial has been made of this apparatus since the above was written, but without success. I am not prepared to state from what cause, but will take an early opportunity of ascertaining the facts or of witnessing its preformance at some future trial.

† Some say 34 minutes.

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moves upon an axis. By the pressure of the reaper's foot the platform is tilted, and the grain drops behind, ready for the person who follows to bind and tie it up. The only objection to this process is that it requires the binding to be done immediately, otherwise the horses, at every succeeding cut, would trample over the previously reaped corn, and, moreover, would effectually impede the working of the machine. Under these circumstances the track previously cut must be entirely cleared in order to prepare for that which succeeds. This operation of the tilting board, which throws the grain upon the track behind, appears to be the chief defect in the machine. A different clearing apparatus, to effect the discharge of the cut grain in a lateral direction would render this machine much more valuable. It would give time for binding up the grain into sheaves, and at the same time it would clear the track for the horses and machine in their return for the next cut.

Canadian machine.

The last machine (the Canadian), which completes the three groups, was withdrawn, from some cause that was not explained.

Results of the trial.

On a careful examination of the several machines entered for the prizes, it will be observed that in every one of them an attempt was made to effect a certain purpose by certain means of transmission, calculated to retard rather than facilitate the progress of cutting. In machines of this description, where horses are employed as a motive power, it is desirable to make the action as easy as possible, and to effect the motion of cutting, reaping, &c. with as light wheels and gear as practicable. Now, these small wheels and their attachments at present in use appear to me to be the very worst and heaviest parts of the machine, and I would earnestly urge upon the makers of reaping machines the absolute necessity of increasing the diameters and dimensions of the gear which works the cutters, and at the same time to fix and attach the journals and ends of the shafts into one casting, so that they cannot vary in position, but must move, and, technically speaking, go and come with the machine. These alterations being made, the proper clearing apparatus being attached to the receiving-boards, we might then look forward to the labours of the harvest being performed with much greater certainty and effect than is now accomplished by the present machines. The following table, which Mr. Edward Combes has kindly handed to me, gives the results of the different trials as follows:—

Trial of Reaping Machines on the farm of M. Dailly, at Trappes, near Paris, 2nd August 1855.

Results of the trial.

No.	Name.	Country.	Breadth of cutting.	Square metres.	Time.	No. of horses.	Price.	Remarks.
			ft. in.				£	
1	Cournier .	France .	4 3	1,628	67	1	26	Driving-wheel 3ft. 3in.; crank makes 11 revolutions to 1; knives not serrated.
2	Atkins .	American	5 3	1,733	24	2	36	Diameter of driving-wheel 4ft. 4in.; crank makes 24 to 1.
3	Lawrent .	France .	5 0	1,825	66	2	. .	Diameter of driving-wheel 3ft.; crank makes 15 to 1; similar to Bell.
4	Mazier .	France .	2 7	Broke down		1	. .	Small machine, cutting either right or left, by means of the cutting-frame turning on a central moveable axis; knives worked by wheel and worm.
5	Manny .	American	4 6	1,900	26	2	26	Diameter of driving-wheel 2ft. 6in.; crank makes 13 to 1.
6	Crosskill, Bell's.	England	5 0	Broke down		2	45	—
7	M'Cormick	American	5 6	1,987	17	2	30	—
8	Dray . .	England	5 0	2,250	35	2	25	—
9	The Canadian	. .	6 6	Retired		2	. .	—

From the above table it will be seen that M'Cormick's American machines performed the most work in the least time; that Atkins' and Manny's executed as nearly as possible the same quantity of work in the same time, there being a fraction in favour of Manny; and that Dray was the next in the order of time and the quantity of work done.

Reducing the whole work done to a standard of 2,000 square metres, the competing machines will stand thus:—

M'Cormick's would cut 2,000 metres in 17·00 minutes.
Manny's ,, ,, 27·36 ,,
Atkins' ,, ,, 27·69 ,,
Dray's ,, ,, 31·11 ,,

If we are, therefore, to takes the quantity of grain cut in the least time, Mr. M'Cormick's machine will stand first on the list, and the others according to their position in the above scale.

Preparation of the land very important.

In the investigation of this subject, we have hitherto confined our observations to the machines. There is, however, another element equally important and essential to the efficiency of the process of reaping, and that is, *the preparation of the land:* and in fact, before we can look forward to ultimate success, the surface must be levelled, and the present injurious system of ridges dispensed with. To a casual observer it is obvious that the present state of culture, as pursued in most parts of Europe, is not calculated

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to afford the necessary facilities for ensuring a successful progression to machinery. To apply machinery successfully to the labours of a farm, the land must be prepared, not for hand, but machine labour ; and the successful introduction of reaping machines will chiefly depend upon the preparations that are made or their reception. The system of ridges may be tolerated, and overcome by the sickle, but to give to the new process of reaping by machinery its full effect, a totally different plan of operations must be pursued, and the fields laid down with a perfectly smooth surface. The larger description of stones and other obstructions should be removed, and in place of the superfluous water not required for the nourishment of the plants, being allowed to flow between the ridges on the surfaces of the field, sweeping in heavy streams, as it now does, everything before it, the new system of drainage will require to be adopted, and the water carried under in place of running over the surface.

Preparation of the land very important.

To make a machine, such as a reaping machine, work well, everything must not be left to the machine ; the agriculturist must do his duty as well as the engineer, and that duty once duly performed on both sides, a certainty of action will be secured, which will solve the problem, and effect satisfactory results. Having arrived at these happy results, we may then, *and not till then*, reasonably look forward to the crops being well and quickly gathered by machinery, to the exclusion of a laborious process, effected with difficulty, and often imperfectly, by the human hand.

W. Fairbairn.

Steam cultivation.

I regret that the Exhibition closed without any declared progress in the great problem of steam cultivation. Hopes had been entertained that a steam cultivator, the invention of Mr. Romaine, brought from Canada, promoted by funds voted by the Canadian legislature, would have been so far perfected, that it might have been presented to the jury for examination ; but unforeseen difficulties beset the path of the inventor, and he was compelled reluctantly to give up the cherished hope of signalising his machine by a public display at Paris.

Still it is just to Mr. Romaine that I should bear testimony to what I saw, and to the point which he had attained. I saw in a field, near the walls of Paris, Mr. Romaine's machine, carrying its own boiler and engine, travel by its own locomotive power 100 yards up the field, and break up and cultivate the land in its course.

Besides taking the lead in promoting cultivation by steam, the Canadian legislature voted a large sum of money (10,000*l.* currency) for the general objects of the Exhibition, and sent some good machines and a magnificent collection of products.

Resources of Canada.

The Exhibition of 1851 brought favourably into notice the great resources of Canada, increased the general confidence in the security of sums invested in its public works, and facilitated the introduction of capital into the colony. The display which was made at Paris cannot fail to fix on broader and firmer foundations the confidence in the natural resources of the colony, and in the intelligence and public spirit of its inhabitants.

Sale of agricultural machinery.

The sales of English agricultural machinery have been for some years past much more extensive to the German states than to France.

Belgium exhibited some good machinery; the first prize for churns and for chaff-cutters were awarded to her. The Commissioners of her Government were diligent in turning the Exhibition to good account. They purchased several of the best English implements, which will no doubt speedily be reproduced, possibly with improvements, in her active and well-appointed workshops.

Foreign agricultural machinery.

It may be sufficient for the purposes of this report to say of the foreign agricultural machinery in general, the collection of which was very large, and of which only a small portion was subjected to trial, that, without venturing to express an opinion of the merits of some of these implements, or of their adaptation to the different localities where they were employed, it did not appear to our machine-maker or to our consulting engineer that they offered models which it would be important to adopt for the purposes of English farming.

Awards of the jury.

Gold medals of honour in Class III. for agricultural machinery were awarded to six individuals only. Five of these exhibitors were from England, and one from the United States of America.

Grand Medal of Honour.

Mr. McCormick, of Chicago, United States of America, for his reaping machine.

Medals of Honour.

Messrs. Garrett, Saxmundham; Hornsby, Grantham; Howard, Bedford; Ransome, Ipswich; Crosskill, Beverley; for agricultural machinery.

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Agricultural Products.

Agricultural products.

The collection of agricultural products was very large, and of high interest. To give a detailed account of them would extend this report beyond reasonable limits; nor for the purposes of this report does it seem necessary, as in the majority of instances there was no question of comparison or competition.

Wool.

The fine wools of Germany were a class to themselves.

Tobacco.

The tobacco of Cuba was without a rival; various specimens, the produce of the soil of Europe, followed at a respectful distance.

Flax.

In the important article of flax, France, Belgium, and Ireland received an equal award from the jury.

France and Algeria.

The rich and varied products of the wide domain of France and of Algeria were set forth in long and imposing array.

United Kingdom.

The agricultural products of these islands were combined in a single collection, formed by my colleague, Mr. Wilson, under the directions of the Board of Trade. It was very complete, carefully arranged and classified, and called forth the warmest commendations of the jury.

British colonies.

No unimportant share of the interest of the Exhibition was supplied by the dependencies of the British Crown, by India, by the continent of Australia, by Van Diemen's Land, by Jamaica, Guiana, &c. The value of their contributions was fully appreciated, and suitable acknowledgments were made by the votes of the respective juries.

Wheat

Amid all the beautiful specimens of wheat from Algeria, from Australia, from Van Diemen's Land, from Canada, it was admitted that no single specimen equalled in excellence the specimen sent from South Australia to the Exhibition of 1851. It does not appear, from the information that has reached me, that these fine grains sown in this country retain the excellence of their original type. Grains matured under a hot sun form, according to the commonly received opinion, the most valuable seed; but in the case of wheat the practice seems to be the reverse of this. It is certain that our strong and prolific wheats are imported largely into France for seed. Not less than 5,000 quarters were imported early in last autumn for this purpose. These strong and coarse wheats no doubt refine in colour and in quality under a more southern sun. It does not appear that the exchange of the fine grains of the south to our northern latitudes is attended with results equally advantageous.

It would be desirable that some careful experiments should be made to induce to greater certainty on this point of so much interest.

Among the specimens of artificial manure, that made from fish, the *Engrais Poisson*, was considered by Professor Wilson specially worthy of notice. Manure.

The fish, after having been steamed, are pressed into cakes and dried. In this form the manure is said to contain from 10 to 12 per cent. of nitrogen, and from 16 to 22 per cent. of phosphate. The price, about 8*l.* per ton.

Progress since 1851.

In reply to the second, and not the least interesting question—"What progress has been made since 1851?" a reply may confidently be given that progress has been made on every side. In machinery, in scientific acquirements, in field practice; and to such an extent, that beyond all question, the productive powers of these kingdoms have been more largely increased within the last four years than within an equal space of time at any former period. Progress made since 1851.

In machine making, though some interesting novelties have appeared, the characteristic feature has been the constant improvement, tending to perfection, of our established implements, and a great extension of their use through the body of the farming community, a fact significant of the superior intelligence which is now brought to bear on farming affairs, promising a sure and continued progression.

First on the list in point of interest, first in its remarkable increase, stands steam machinery.

No farmer who has ever had a steam engine on his farm will ever again be without one; no farmer who has ever thrashed his corn with steam power could bear again to see his horses toiling in the wearisome circle, now jerking onwards when the whip sounds, now brought almost to a stand-still when the machine is clogged by a careless feeder. The regular stroke of the untiring steam engine gives excellence to the work, keeps everybody in his place, and introduces among men, even the most careless, something of its own exactness and precision. Steam machinery.

It was thought a remarkable thing that in the year 1851, one firm, Clayton and Shuttleworth of Lincoln, a firm not known to the agricultural world ten years ago, should have constructed and sold in one year 140 portable steam

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Steam machinery.

engines. Since 1851, the annual progress has been as follows :—

	Engines.	Aggregate horse power.
1852	sold 243	1,349
1853	„ 293	1,723
1854	„ 363	2,297
1855	„ 491	3,332
	1,390	8,701

Besides the constant increase in numbers, it will be seen there is a constant increase also in the power of the machines. In the year 1851, each engine averaged scarcely the power of five horses. In the year 1855, they average nearly seven.

It is computed that 90 per cent. of these engines are used for agricultural purposes in England; the remaining 10 per cent. are sent abroad, or are used for purposes not connected with agriculture. We have therefore in the last four years, deducting 10 per cent. from the whole number of 8,701, a power equal to 7,831 horses added to the force of the farmer from one firm alone. Messrs. Clayton and Shuttleworth direct their attention exclusively to steam engines, and to machinery moved by steam power. This devotion of the undivided attention to one class of objects is of itself an indication of progress, and conducive to perfection.

The increased power afforded by steam has induced to improvements in all machinery moved by steam, in none more than in thrashing machines. The corn now is commonly delivered from the stack upon the machine, and delivered from the machine into sacks ready for market; a great economy of time and of money. For these and similar processes, the use of steam power is making rapid strides, and will continually extend itself, to the great help and furtherance of every operation to which it can be applied.

Advantageous results of the Exhibition of 1851.

Our leading machine-makers all concur in attributing marked results to the Exhibition of 1851.

Messrs. Garrett have foreign orders, arising from connexions formed at the Exhibition, still coming in. One customer in Hungary has had not less than 8,000*l.* worth of machinery, chiefly drills and thrashing machines. Drills have been improved by a new steerage patented in 1854.

Chambers' patent manure distributor is a new instrument, the invention of a practical Norfolk farmer, it will

sow from 1 to 100 bushels of artificial manure per acre, delivering it with great regularity, and is excellent for the simplicity of its construction.

New and improved machines.

Drills for liquid manure are still undergoing improvement. If found useful in this country, how much more valuable are they likely to prove in the dry and sun-burnt plains of Southern Europe?

Messrs. Hornsby consider the improvements in thrashing machines to be equal to a new creation of the implement. Their business has increased three fold since 1851.

Messrs. Howard find the demand for improved implements to come now mainly from the tenant farmers, formerly it was in a great degree confined to amateurs and large proprietors. The business of all the leading machine-makers has doubled since 1851.

Messrs. Ransome concur as to the improvement in thrashing machines, and as to increased demand for machinery. Much has been done, but much remains to be done still.

Messrs. Smith and Ashby date the wide diffusion of good implements from the Exhibition of 1851. The Paris Exhibition has opened to them several new sources of trade, in France, Algeria, and Germany, and has led to the appointment of an agency in Berlin for the introduction of improved machines into Germany, at the instance of a spirited merchant of that city.

Messrs. Bentall have found the demand for improved machinery increase largely since 1851.

Such has been the uniform tenor of the replies from all the leading machine-makers from whom communications have been received. There is a host of local makers, equally alive to the importance of improvement, and adding largely in their respective spheres to the stock of good implements.

Agricultural Chemistry.

Agricultural chemistry.

In speaking of the progress of agricultural chemistry, the name of Mr. Lawes must be placed by English farmers in the first place of honour. Without entering on the high controversy between Baron Liebig and Mr. Lawes, lately revived with increased animation, the English farmers have wisely accepted the teaching of Mr. Lawes, based on experiments, in the care and accuracy of which full reliance may be placed, and the results of which are open to the view of all. They have learnt that the approved artificial manures are not mere stimulants, but agents of fertility which, when

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properly applied, may be depended upon with certainty to produce a crop. The principles on which the growth of corn depends are better understood. The repetition of corn crops on the same soil can no longer be considered as necessarily faulty in principle, and to be unconditionally condemned. It is rather a question of expediency, to be decided by the costs of manure and of produce.

These lessons the English farmers have learnt from Mr. Lawes. They have accepted them with becoming gratitude. They are practising them with increasing confidence, day by day, to their great and proved advantage.

Remarks by Mr. Way.

Mr. Way, to whom also the farming world is under the greatest obligations, has snatched a few moments from his professional pursuits to furnish me with the following sketch of the general progress of agricultural chemistry.

This department of applied science is now attracting to itself the attention of able chemists in all countries; and the contributions to knowledge resulting from the various investigations have, during the last few years, been very considerable. To attempt anything like an account of these results in this place is obviously out of the question, and we content ourselves with little more than an enumeration of the principal and most interesting investigations.

Feeding and fattening of animals.

In this country, Mr. Lawes has continued his experiments on the laws concerned in the feeding and fattening of animals, taking, for the objects of trial, pigs and sheep. The number of animals experimented upon, the intelligence and care brought to bear upon every detail of the experiments, and the very considerable expenditure which has evidently accompanied them, place these investigations far in advance of any of a similar kind that have been undertaken elsewhere. Although the results are of a practical character, the experiments of Mr. Lawes must not be classed with the very numerous trials on the feeding of animals that are to be found dispersed through agricultural publications, and which are *merely* practical, being undertaken without reference to general principles. The results of Mr. Lawes' inquiries are too numerous to be stated here, but they seem to point out that a just balance of the different constituents of food is of more importance in the feeding and fattening of cattle than a predominance of any one; that neither the albuminous or farinaceous elements of food have an exclusive value for the purposes to which they are applied; and that the classes of vegetables which are peculiar in containing a high proportion of nitrogenous matter are not necessarily, from that circum-

stance, the most adapted in practice to produce that part of the animal body (muscle) which most resembles them in composition. According to Mr. Lawes, therefore, the valuation of foods in relation to their contents in nitrogen is attended with much fallacy.

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Amongst other papers, Dr. Vœlcker, of Cirencester College, has published an account of experiments made with a view of ascertaining the cause of the fertility produced by burnt clay when used as manure. He has arrived at the opinion that the effects are partly mechanical, but principally due to the liberation of potash from silicates of that alkali existing in the soil, but only slowly available until released by torrefaction.

Dr. Vœlcker on manure.

Mr. Way has published two further papers on the important subject of the absorption of manure by soils, in continuation of his first research on this subject, which was published in 1850. Mr. Way attributes the power possessed by soils to remove various alkaline bodies (as potash, ammonia, &c.), from solution in water, to the existence of a class of double silicates of alumina and another base, which is generally lime or soda. Mr. Way has succeeded, for the first time, in producing this class of salts; and he argues, from the effects observed in soils, that these latter contain the silicates in question in small quantity, and hence their power to preserve soluble manures from loss by rain and drainage. His second paper on this subject refers to the action of lime on soils; and he endeavours to show, from the large quantity of ammonia existing in almost all soils, which, according to his experiments, very far exceeds the doses of this alkali usually applied in manure, that lime acts much in the same way as ammoniacal manures themselves, by furnishing indirectly a supply of nitrogen to plants. The effects of over-liming are accounted for in the same way.

Mr. Way on manure.

Mr. Way has also given an account of his examination of certain beds lying immediately below the chalk formation, which contain large quantities of what is known to chemists as "*soluble silica.*" This form of silica has not hitherto been met with naturally, except in the case of some strata in the Department des Ardennes, in France, which were examined four or five years ago by M. Sauvage. From their peculiar nature they are supposed to be available with advantage for many purposes in the arts, and as a source of soluble silica for agricultural use.

Soluble silica.

The subject in the chemistry of agriculture, which has lately, however, attracted the greatest share of attention, both

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Nitrogen.

in this country ard abroad, is that of the source from which plants derive their *nitrogen*. It has been satisfactorily proved that plants growing in the ordinary way often contain more of the element nitrogen than they can obtain from the soil in which their roots are placed; and it is obvious that in some way or other this accumulation is derived from the atmosphere. Now, the air surrounding the globe is composed of a mixture of nitrogen and oxygen gases in the proportion of about four parts of the former to one part of the latter; it also contains small quantities of other gases, such as carbonic acid, nitric acid, and ammonia. The question at issue is, as to whether plants can, under any circumstances, make use of the great bulk of the nitrogen of the air in building up their tissues, or whether they derive the observed excess from the ammonia and nitric acid in the air. This question, the interest of which, both in a purely scientific and agricultural point of view, can hardly be overrated, has enlisted the energies of chemists on both sides, and has given rise to some admirable researches. It has also involved the extended examination of air and rain-water, in order to ascertain how much ammonia and nitric acid are usually contained in the one, and brought down by the other. The principals in this discussion in France are MM. Boussingault and Ville; both of these chemists have made extended series of experiments on plants grown in glass-cases; their conclusions are, however, diametrically opposite: M. Boussingault contending that plants cannot make use of the atmospheric nitrogen, but must be indebted to the nitric acid and ammonia in the air for their supply in excess over that furnished by the soil; M. Ville maintaining that in the absence of both of these, an increase of nitrogen in plants still takes place. A Commission of the French Academy of Sciences, recently appointed to look into this matter, leans rather in its report to the side of M. Ville, but the question is still far from being set at rest.

Ammonia and nitric acid in rain.

M. Barral has determined the quantity of ammonia and nitric acid brought down by rain in Paris. M. Boussingault has repeated these experiments as regards ammonia in Alsace, and finds the quantity very much smaller than in the rain of the city, a circumstance which we should be prepared to expect. M. Boussingault has also examined, with the same object, the water of fogs and dew, and of rivers and streams. M. Ville has carefully determined the ammonia existing in the air both in the interior and suburbs of Paris.

Mr. Lawes and Dr. Gilbert have published the results of

an inquiry into the quantity of ammonia and nitric acid in rain falling at Rothamsted, in Hertfordshire. The methods of determining small quantities of nitric acid are at present so imperfect, that Messrs. Lawes and Gilbert have not thought it well to publish their results as to this substance, but they are led to believe that in quantity it exceeds that of ammonia in rain. Besides the names we have mentioned in connection with these researches, other continental and English chemists might be referred to, if circumstances admitted of greater amplification. It is, however, obvious, that in this hurried sketch we have omitted all notice of many investigations on this and other subjects of agricultural chemistry which might well claim attention in a more extended review.

Artificial manures

Finally, we must not omit to mention, that the trade in artificial manures, which is rapidly rising into such national importance, especially in England, is receiving the most important aid at the hands of chemical science. Not only are the various waste substances of manufactures and of daily life worked up into available form, but the manures produced by chemical means, more especially the superphosphate of lime, are daily improving in character, mainly through the suggestions of chemists who have specially devoted themselves to this branch of science. Fresh sources of guano have also been discovered, and new supplies of substances useful to the farmer have in several places been obtained.

It is, therefore, not without reason, that we congratulate ourselves on the progress which has, within the last five years, been made by that department of agriculture which is based upon chemical science.

Field Practice.

Draining.

The greatest improvements in cultivation and management have taken place in the strong lands. Draining is the foundation of all these improvements. Draining, now better understood and generally well executed at a sufficient depth, has changed the character of whole districts, turning unmanageable and unprofitable soils into easy-working and productive land.

It would be interesting to ascertain the extent of land drained each year; but no sufficient data exist for a reliable estimate. Draining operations are carried on by means of the public loan, the capital of private companies, and of individual proprietors.

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Of the public loan of 4,000,000*l.*, the sums issued for works in each of the last three years have been—

1852 . . .	£410,478
1853 . . .	318,637
1854 . . .	322,728
	£1,051,843

What proportion do the lands drained by the public loan bear to the lands drained by private capital? If the example of this district should be a clue to the whole area of the country, the lands drained by the public loan would not be more than one-fourth of those drained by private capital. In such case, the total sum expended in draining for the last three years would amount to 5,257,615*l.*, and allowing 5*l.* for the expense of an acre, the extent of land drained would exceed 1,000,000 acres. This sum, or whatever sum may have been expended in draining, will have been capital supplied mainly by the proprietors of land. A sum equal to the above in amount has been expended, mainly by the tenant farmers of the three kingdoms, in the purchase of a single article of manure; and this is not a vague estimate but an ascertained certainty.

Guano.

The sales of Peruvian guano by Messrs. Gibbs for the last three years have been—

	Tons.
1852	118,000
1853	135,000
1854	177,000
	430,000

Linseed cake, &c.

Allowing 12*l.* per ton for cost and carriage, the sum expended amounts to 5,160,000*l.*

To this must be added the large outlay on linseed cake, on bones, rags, on minerals containing fertilising principles, on lime, plaster, &c. With these combined efforts on the part of the owners and occupiers of the soil, there can be no danger in asserting that the productive powers of these islands have largely increased, and are continually gaining new force.

I have said that the most marked improvement has taken place on the strong lands. Draining and autumn cultivation, materially assisted by good implements, have enabled the occupier of strong land to add Swede turnips to his course of cropping. The importance of this addition

is beginning only to make itself felt. This root, which, with its different varieties, created the value of the light lands, is now performing a service almost as great to the strong lands, not, as on light lands, for feeding sheep, but for feeding cattle. The quality of the turnips grown on strong lands is greatly superior. The land will bear the whole crop to be carted off to feed cattle in yards. Cattle supply manure, manure gives corn. It is difficult to estimate the addition, in meat and in grain, which this alternating process will surely afford.

Value of improved implements.

It may be thought by some that too much stress has been laid on the value of improved implements. It may be worth while to examine the point more closely.

What saving might be effected on a farm of 200 acres of arable land, (the rental, say, 25*s.* per acre,) drained and laid into fields of a suitable size, by the use of good implements? All land is ploughed at least twice a year. The difference in labour between ploughing drained or undrained land is very great.

It would be an estimate much below the mark to put it at 1*s.* per acre for each ploughing.

For the year, 2*s.* per acre.

The next process would be sowing the seed.

On the old system, 2½ bushels of seed wheat would be sown broadcast per acre.

On the new system, with an improved drill, 1½ bushel woud be sown, with better results.

Saving.

There would be a saving, therefore, of one bushel per acre on the 50 acres sown with wheat, which, at 7*s.* per bushel, amounts to 17*l.* 10*s.*, or per acre, over the whole area, 1*s.* 9*d.*

On 50 acres of barley there would likewise be a saving of one bushel of seed per acre, which, at 4*s.* per bushel, would give a saving per acre of 1*s.*

Next comes the preparation of the grain for market. There are to be thrashed the produce of 50 acres of wheat, at a yield of four quarters only per acre, 200 quarters; of barley, 50 acres, at a yield of five quarters per acre, 250 quarters. The cost of thrashing wheat by the flail, and dressing, is 4*s.* per quarter; by an improved steam machine, 1*s.* 6*d.* Saving on 200 quarters of wheat, 25*l.*, or, per acre, 2*s.* 6*d.* The cost of thrashing barley by the flail is 3*s.* per quarter; by steam machine, 2*s.* Saving on 250 quarters, 12*l.* 10*s.*, or, per acre, 1*s.* 3*d.*

Total saving by the use of drill and thrashing machine, 8*s.* 6*d.* per acre, or one-third of the rent, 25*s.*

Mr. Denison on Agricultural Implements, &c.

Besides the economy and direct gain to the farmer, the saving of one bushel per acre of the grain employed in reproduction is an important aid to the consumer, and when multiplied over the total area of land still cultivated under the old system would form no insignificant addition to the annual resources of the country.

Advantages of the Royal Agricultural Society.

The rapid spread of useful information and of approved practice must be laid to the account, in no small degree, of the journal and of the meetings of the Royal English Agricultural Society. The meetings of the Society, held in each year in different districts, enforce precept by example, and communicate every variety of useful information in the most attractive form.

Conclusion.

Such are some of the proofs of the onward march of agriculture, and of the progress which it has made since the Exhibition, and, in many points, by virtue of the Exhibition of 1851. Still we feel ourselves to be only on the threshold, and much remains to be done. We ask of science to penetrate yet deeper into the secrets of Nature's laws. We ask of mechanical art to bring to our aid in the field the mighty agency of steam.

We call upon the farmers to continue and increase their efforts, so alone will they be able to keep pace with the demands made upon them by a population ever increasing in numbers and in wants, and to maintain the place in the front rank which they now honourably hold.

The verdicts of the Paris jury will be a warrant that no jealous or narrow spirit ruled its deliberations.

It is a pleasing duty, in closing this report, to be permitted publicly to acknowledge, not only the personal courtesy, but the spirit of fairness and candour, which characterized the entire conduct of my colleagues of all nations. It was my fortune, in the Council of Presidents and Vice-Presidents, and as one of the Committee of seven for the final revision of the awards, to assist in the proceedings of the Commission to their close. The same honourable spirit animated this high council, under the immediate guidance of the illustrious Prince, its President, w himself afforded an example to all of fearless impartia ho and even-handed justice. lity

I have the honour to be, &c.

J. Evelyn Denison.

On Coachmakers' Work, Harness, Saddlery, Whips, and Trunks, by the Right Hon. the Earl of Shelburne, M.P., Juror for Class V., Special Machinery and Apparatus for Railways and other Modes of Transport.*

To the Right Hon. the Lord Stanley of Alderley,
President of the Board of Trade, &c. &c.

My Lord,

Subjects reported upon.

The Fifth Class of the French Industrial Exhibition of 1855 comprised generally all means of conveyance by land, and included therefore locomotive and railway as well as common carriages. It also comprised articles connected with carriages and travelling, such as harness, saddlery, portmanteaus, and trunks. The jury found it would facilitate their labours to divide these objects into two categories, as it was obvious that a different knowledge was required for the different sections of the subject, and although they deliberated collectively from time to time, the examination of the various articles exhibited was practically conducted by each section separately. I therefore refer only in this short notice to the things with the special examination of which my section was charged, such as coachmakers' work of all sorts, harness, saddles, and bridles, bits, spurs, buckles, &c., whips, trunks, and valises, and railway carriages or waggons.

1. Coachmakers' Work and Carriages generally.

Carriages.

It is difficult to form a very correct estimate of the comparative progress of the coachmaking trade in the different countries, as exemplified at the Exhibition, because so many of the most eminent firms in this trade in Paris, London, and elsewhere did not exhibit. The number, however, of

* I was not informed till I had concluded my business as juror, that the Board of Trade would call upon me for any report of this kind; and as I was not charged with drawing up the report of the jury to which I belonged, I found myself less prepared than I otherwise should have been to meet their wishes; I hope this will be taken as an excuse for what I feel is a very meagre and imperfect notice. I append an excellent Report on the subject by Mr. Hooper, an exhibitor, which was read at a meeting of the Society of Arts, as it supplies many valuable details.

LORD SHELBURNE ON COACHMAKERS' WORK, &c.

carriages in the building was considerable. They presented, perhaps, more attraction in the way of mechanical ingenuity than in good taste. In this latter point of view it is of course more difficult to establish a standard of merit than in any other; for although good materials and good workmanship are susceptible of positive proof, on the other hand the different requirements of the various countries in which carriages are used, the national habits, fashions, and ideas of those countries, establish in many instances a completely different point of departure. There is, however, sufficient analogy in this respect between Belgium, England, France, &c., to justify a severe criticism on the bad taste displayed by many of the coachmakers of the two last-mentioned countries; of this there are more instances in the French than in the English carriages, owing partly to the greater number exhibited. There are repeated attempts to apply ornamental work to carriages, which, from their nature, are obviously destined to be useful and neat, not ornamental, equipages, such as the application of lamps which might belong to a Lord Mayor's coach, to the body of a plain Brougham, &c. It is just to Belgian exhibitors to say their carriages are more free from this defect.

Bad taste of the makers.

Progress of coach building in France.

Leaving, however, the question of taste, which is a matter of opinion, and comparing the material and workmanship of the carriages exhibited, it must be admitted that the art of coachmaking has made great progress of late years in France. Their carriages are light, the lines of many of them are very good, the elliptic spring, so much in use in the present day, is made in such a way as to give a great amount of ease, and the workmanship and material in many of them is strong and good. For very hard wear and tear, I doubt their being equal to the best English work, but the wear on the London pavement (speaking only of the highly finished class of carriages) applies a more severe test to the coachmaker's work than any to which a Parisian carriage is exposed. The system of the door and step opening with a spring, especially the former, which has long been adopted in Paris, but is little used in London, is practised with great success. In the large underspringed carriages there is so little difference in the style in what is considered a first-rate barouche, chariot, or coach, that there is scarcely anything to be remarked beyond the fact that the prices of the first houses in Paris are decidedly cheaper than those of the first houses in London; and, secondly, that with respect to trimming and lining, the French are, if anything, superior to the English. With respect to the smaller class of carriages,

more important in a utilitarian point of view, because so much more used, a great number of changes have been introduced by French coachmakers. The majority of these, however, although ingenious, have not succeeded in obtaining useful practical results.

Improvements.

The species of carriage introduced originally by Mr. Rock, of Hastings, called Amempton, changeable at pleasure into different forms, and useful to many where coach-house room is not extensive, has been adopted by the French trade, and several successful improvements have been introduced.

Again, among the two-wheel carriages, an ingenious improvement has been invented by a French coachmaker, in the system of shifting the body according to the load to be carried. This consists in a piece of machinery, by means of which the body slides with great facility on the spring itself, which acquires a greater or lesser power of play, according to the weight it is destined to carry.

A very pretty sort of sociable was exhibited by a Lyons coachmaker, the ornaments of which, it is true, were not in accordance with the taste of the day in London or Paris, but the circumstance of its having been destined for Tunis rendered this an exceptional point, and with respect to lines it was impossible to see a prettier shaped carriage of the kind. The price also was low.

Where carriages are destined to be taken to pieces with a view of adapting them at one time as shut, and at another time as open carriages,—such as Starey's cottage dog cart, which appears to be one of the most practical inventions of its kind,—a superiority manifests itself in the strength of the bolts and appurtenances which become necessary in such a case; but although a difference exists, the French builders have improved in this respect also, and frequently invent alterations of detail which are worth the examination of their neighbours.

Belgian carriages.

The only other carriages which compete at all successfully with the English trade, are those from Belgium, a few of which are strong and well finished with respect to workmanship and taste, and at prices considerably inferior to carriages of the same quality in England. Those exhibited by other countries, though not devoid of merit, and possessing sometimes the attraction of cheapness, are not to be placed in the same rank with those to which I have alluded. At the same time I may state, that I have seen formerly in Austria carriages far superior to anything that was exhibited by the Vienna coachmakers on this occasion.

Lord Shelburne on Coach-makers' Work, &c.

The number of carriages annually exported from France is very considerable, and shows to what an extent they are getting possession of the foreign market.

Number exported from France.

In 1854 the value of imported carriages was - 45,594frs.
Exported ditto - - - - - 137,942frs.

N.B.—It must be observed that all the opinions expressed in this notice on the comparative merits of the different carriages are necessarily incomplete, as there was no means of ascertaining one very important point, viz.: How each carriage "followed" on the road.

2. Harness, Saddles, and Bridles.

Harness, saddles, and bridles.

With respect to these articles the English trade maintains its superiority, chiefly in respect of the leather used in making them. The French and Belgian trades have made great progress (without, however, surpassing the English) in the stitching department. Their saddles are pretty and light. The chiselling of the French ornaments for harness has reached a great perfection, and, taken as a whole, this branch of trade in France, both for good manufacture and for variety of invention, ranks very high.

The Germans in general are inferior to the French and Belgians in this respect, though a decided progress is perceptible. An ingenious, and, for cavalry purposes, important invention in saddle trees has been introduced by an Austrian saddler, rendering the same saddle serviceable for a greater variety of horses by means of expansion, and the reverse. In the Prussian exhibition a collection of fancy bridles, well imagined and well finished, was worthy of notice.

The application of india rubber appears to have been more introduced in England than elsewhere, and is applied with success to dumb-jockeys, and other articles in the saddlery department, by Messrs. Blackwell.

3. Bits, Spurs, and Buckles.

Bits, spurs, and buckles.

The English trade made a good show. Their superiority chiefly exhibited itself in such articles as were of the plainest description. With respect to the cheaper articles of metal, whether in the category above mentioned, or belonging to those used in the coachmaker trade, such as mountings for poles, splinter bars, &c., the French and Belgian trades distinguished themselves; and the former were remarkable

for good design of engraving on those articles which were destined for ornamental purposes.

4. Whips.

Whips.

In whips the only two nations worth mentioning are the English and French. For a strong serviceable whip, whether for riding or for driving, the English manufacture is superior. For ornamental and fancy goods, the French surpass us; and again, descending to the commonest style of goods, the French manufacture riding and driving whips at prices considerably inferior to the English,—a tolerably neat driving whip, very serviceable, being furnished for one franc.

5. Trunks, Valises, &c.

Trunks, &c.

In trunks, valises, &c., the Exhibition produced a variety of good and ingeniously constructed articles. For hard wear and tear, good fitting locks, &c., the English goods were superior, but the prices were also higher. Much more ingenuity of contrivance and novelty were exhibited by the French trade. With respect to the last quality, a railway trunk of great lightness and strength was exhibited, the construction of which was effected by veneering in two layers crossways, possessing strength enough to bear when empty the weight of a heavy man, and being at the same time excessively light. In bonnet boxes, &c., there was a great deal worthy of notice, but the details are too minute to be specified.

6. Railway Carriages or "Waggons."

Railway carriages.

There was not much at the Paris Exhibition to be noticed under this head, very few having been sent. A Swiss waggon, which was of great length, and combines accommodation for a large number of second-class passengers with a small first-class saloon, possessed merits of arrangement which might be well adapted for the exigencies of a particular class of railway traffic. The workmanship was of an inferior description to what is generally seen in England. A superior railway carriage was exhibited by a Belgian firm, worthy of attention on account of its interior arrangement, which provided facilities for converting the seats into couches, in one of its compartments, without in any way impairing the ordinary use of the seats. The price of this carriage, though well made, was considerably below the value of the corresponding work either in France or England.

I have the honour to be, &c.

Shelburne.

Lord Shelburne on Coach-makers' Work, &c.

Appendix.

APPENDIX.

The Carriage Department of the Paris Exhibition.

Character of carriages affected by railways.

It may be remarked, in examining the carriage department of the Paris Exhibition, as of the Exhibitions of London and Dublin, that none of them contained a single specimen of a posting travelling carriage, such as before the construction of railways was as necessary a part of the establishment of a nobleman or rich landed proprietor, as was his service of plate or his valet. Travelling is so altered with the almost universal system of railways, that such carriages are now only retained by royal personages and others of high rank. Railways have however in other ways affected the manufacture of carriages. Formerly it was of the utmost importance that a carriage should be very capacious, as journeys frequently occupied several days, and a frequent change of position, and room to sit comfortably, were essential to a snug journey. On account of their great size and the quantity of luggage they had to carry, it was necessary to make them strong, not only to sustain the weight put on them, but to resist the shocks and concussions on bad roads. All classes being now conveyed by railway renders such carriages almost obsolete; in fact, they are only required for travelling in remote parts, where railways do not exist.

Public carriages.

An omission in each of the Exhibitions has been the almost entire absence of public carriages for common roads; such carriages are still required where no railroads are made. It is true there are very few four-horse coaches, "the pride of the road," now running in England, but considering the high degree of perfection such conveyances had attained before the introduction of railroads in England, an example of one of them would have been worth sending to the Paris Exhibition, as not only in France, but in other countries of Europe, are the public conveyances travelling distances fifty or more miles apart still of the most cumbrous and clumsy construction. It may be said that for every two passengers conveyed by an English stage or mail coach, taking weight for weight, a French "diligence" or German "eilwagen" only carried one passenger, and that at little more than half the speed of our English coaches. Many continental roads are now as good as English roads, and foreigners may much increase the speed of travelling where railways are not yet made.

The public carriages for towns and cities are only represented by one omnibus. No Hansom's cab appears, nor does Paris show any of the little four-wheel phaetons now so numerous in the French capital. A London four-wheel cab would certainly not shine in such an assemblage, but a comparison of the public carriages of the great European capitals might have led to improvements in all.

Few exhibitors of first-class carriages.

Very few of the builders of the first class of carriages in London or Paris contribute to the present Exhibition. Were the system of prizes abolished, and the public left to form their own judgment of what was placed before them, they would probably come forward and materially raise the character of the productions sent to such Exhibitions. The award of a prize medal does little good to such houses as are already well established and doing a large trade, whereas the withholding one (either from the jurors being deceived by a novelty without utility, a "tour de force," or a display of profuse decoration,) may do them an injury, which they prefer not to risk.

Countries exhibiting.

The countries exhibiting are England and Scotland, France, Belgium, Hamburg, Austria and Lombardy, Sweden and Norway, Sardinia, Holland, Canada, Switzerland, and Mexico.

Those not represented are Prussia, Saxony, Hanover, Bavaria, Russia, Ireland, Spain, Portugal, Naples, the Roman States, and United States of America.

Position of England.

It may be safely said that as far as the Exhibition represents the state of comparative excellence, England maintains her position for turning out soundly-made and well-finished carriages; constructed so as to give comfortable accommodation to those who use them, and in such a manner that the proportions are well balanced; strength being applied to those parts where it is requisite, and

unnecessary material and workmanship avoided where it can do no good. In a point where English carriage builders might possibly have been expected to be somewhat behind, they still take the lead; the outline and proportions of their carriages are superior to the foreign ones. English coach-builders have maintained simplicity of outline with elegance, and have made their carriages for what they are intended, and not as specimens of what it is possible to accomplish. Many of the English exhibitors in this department are themselves practical draughtsmen, and have worked at the actual framing and making of carriages, whereas the foreign builders, although in some instances good draughtsmen, have not worked at the actual framing and construction of carriages, but at the after fitting of leather work and lining; these parts in consequence attract their chief attention.

France. France sends several well made carriages; the best are those made after English models; they are well proportioned, with good workmanship, avoiding useless labour and worthless decoration. Some excellent enclosures for converting open carriages into close ones are shown. Lille and Bordeaux follow closely on Paris in the quality of their carriages.

Among the French carriages a large proportion are mere "tours de force," only fit to be kept in a room. The decorations are almost their only feature (the two lamps on one carriage are said to have cost 80*l.* sterling, and they are certainly very beautiful). Such carriages will, probably, be rewarded with a prize medal, from the mere amount of money spent on them; and almost any amount of decoration can be had in Paris where money is forthcoming.

France also exhibits several plans for detaching runaway or fractious horses from carriages, but they all seem to have the objection that the horses may become detached by accident, and probably cause the evil they are intended to avoid. It would be better for French drivers to attain greater perfection in their calling; they seem to drive in the most careless manner possible, almost invariably with loose reins, not keeping a sharp look out in front, or on their own side of the road; it is not uncommon for the driver of a diligence to sit on the reins of the five horses he is driving, while with the whip in both hands he lashes his rough stallions, each in his turn, and in proportion to his merits. While such driving continues accidents must be unavoidable.

The present Emperor has given a great stimulus to the building of carriages in France. Having resided so long in England, he has imbibed a taste for carriages and horses. Of the former he has had a very large number built since he has been in France; they are nearly all in the English style. His dress carriages are decorated with extreme richness. Giving a very large price for the best English horses, his equipages are such as are not to be equalled in appearance in any other capital. This has set a fashion in Paris for good carriages, and has of late years rendered the trade of coach-building in the French capital very flourishing.

French export trade. Paris makes a number of carriages for foreign countries, chiefly Spain, Italy, North and South America, and Egypt; moderate duties favourable to the French, and a liking of many foreigners for their rich silk linings and fittings are probably the cause of this export trade.

Prices. The prices of the best French carriages are now about the same as the English. Their system of ready money transactions with their customers facilitates their operations, and enables them with a moderate capital to carry on a good trade, whereas the long credit taken by many persons using carriages in England cripples the trade, and causes such persons to say that English carriages are expensive, whereas those who pay at once for what they buy get their carriages quite as cheap, quality considered, as any foreign country can produce.

Hamburg. Hamburg shows a single carriage of excellent workmanship, though, from its contrivance, it is not likely to be comfortable for those who use it. Hamburg has probably advantages for coach-building from the absence of customs duties. It is said to have the largest private carriage manufactory in Europe, carrying on trade with Russia, Northern Germany, and other parts.

Belgium. Belgium shows a variety of carriages, chiefly in the French style, but most of them, although cheaper, of inferior workmanship to the French. Antwerp, a provincial town, shows some carriages superior to those of Brussels, the capital.

The Belgians seem, like the French, to put much useless work in their carriages.

Lord Shelburne on Coach-makers' Work, &c.

Appendix.

Sardinia shows a carriage of sound construction, good finish, and proportions.

Austria.

Austria sends several carriages; they are all of inferior workmanship, of bad outline and proportions, mostly very heavy, and of rough finish.

Canada.

Canada shows two light carriages of moderate workmanship.

Holland.

Holland contributes a variety of carriages:—a barouche made to the order of the king shows some good workmanship; a phaeton, except the wheels, entirely of iron, also shows good workmanship, but such carriages have been found not to answer on common roads, from their being too rigid—a certain proportion of wood in combination with the iron deadens the concussions of the road, and imparts a certain amount of elasticity, which tends much to the durability of the carriage.

A two-wheel carriage shown, with picture panels to the body, hung on leather braces only, without springs, would have a very rough swinging motion; it seems built for one of the Dutch colonies in the East.

Sweden and Norway.

Sweden and Norway show some well-made sledges, with excellent fur appointments. Norway shows some light two-wheel carriages, each to carry one person. Two are without springs, and must be unbearable, except to those accustomed to their use. One has so many springs, that in bad roads it would be difficult to keep one's seat, from the rolling motion it would have while in use.

Mexico.

Mexico sends an elaborate open carriage, with enclosures to carry four persons inside. A great amount of useless labour has been expended on the carriage; it is loaded with ironwork, which, though very well made, adds a most unnecessary weight to it. Although called a Mexican carriage, a great part of it was made in France, and sent to Mexico, where it was put together. After its re-entry into France, it was again overhauled, revarnished, and partly repainted. Being so much better a carriage than a country like Mexico might be expected to produce, it is, in fact, only a "tour de force," produced, it is said, at the expense of the Mexican government, regardless of outlay, and of its not being made in the country whose manufacture it is intended to represent.

With the exception of Ireland and the United States of America, the manufacture of carriages in the rest of the world may be said to be in a backward state.

Improvements in carriage buildings.

With regard to what is new in this department, the advance made during the last few years must be looked for more in improvements and useful adaptations, than in any striking inventions. Coach-builders are bound within certain limits. They have to provide vehicles to carry one or more persons, on two or more wheels; and the immense variety of carriages that have been made attests a very fair amount of ingenuity. Although the show of carriages from England is small compared to the contributions of the whole continent, it may be said that foreign builders have more to learn from the English carriages, than the English builders from the foreign ones, the best foreign carriages being still built in the English style.

The carriage called a "sociable," sent from England, is new to foreigners, and has already caused many to be built in Paris like it. The Emperor of the French procured two such carriages from England expressly for the use of our Gracious Queen while in Paris. A phaeton, with a novel kind of head, to lift by a very simple plan, has attracted attention; the plan will probably be adopted by some of the foreign builders. A "Pedomotive" is shown, consisting of a very high wheel, having a seat attached to both ends of the axle, which passes through both sides of the centre of the wheel, and affords locomotion to two persons, who keep it moving by a light run. The inventor asserts that a high speed can be obtained on a good road by his invention. Some very good machine-made wheels are shown in the English department. There are also shown some good perspective views of carriages, produced by photography; they are among the first produced by this means. There are also shown some good specimens of carriage laces. Among them are illustrations of a plan, invented by Mr. Dart, for weaving consecutive numbers in lace, or even sentences, which, though not applicable to private carriages, may well be applied to the interior of railway carriages, and to the numbers on the collars of police and soldiers' coats, caps, &c.

In the French department a coach-builder shows an excellent full-size drawing of a carriage. It is chiefly noticeable for its good drawing, and not for its proportions and contrivance. A carriage is shown with panels of glass. Such a

carriage offers little chance of durability, though to overcome the difficulties of bending and fixing the panels shows a great amount of perseverance; it is an inferior carriage, with tawdry decorations. It is said to be sold for Mexico.

France shows a public omnibus of sound workmanship. It is much heavier than most English ones, but will carry fourteen passengers inside comfortably, each in a well defined and separate seat; ten persons can be carried outside on a seat running from end to end of the roof, passengers sitting back to back. A convenient raised rail surrounds the top of the omnibus and ensures the safety of the passengers, as it is not difficult to lose one's balance on taking or leaving a roof seat, should the horses move the carriage during the operation. The steps to ascend to the upper seats and descend are very conveniently arranged. The driver is intended to sit quite alone. There is no door behind, the conductor standing on the step, and being prevented falling by a loose moveable strap passing across the doorway; he is protected from the rain by a portion of the roof projecting over the step. The hind part of the omnibus is provided with a dial, numbered, and having an index-hand working from the centre, which the conductor has to move forward at the entry of each passenger, and at the same time causing a bell to ring. The state of the index is read off by a clerk as it passes any of the branch offices on the line of journey; the dial apparatus is opened and set back at the commencement of each journey, when its numbers have been finally read off. This is an excellent plan for keeping the money-taker honest. The driver can be signalled when to stop by pulling a cord so arranged as only to give a slight pull to his arm. The front springs are arranged in the same manner as the hind ones, namely, two side springs with a cross spring. For heavy carriages, which carry uncertain loads, sometimes under, and frequently overloaded, it is an excellent plan, and so much better than the short stiff elliptic springs invariably used for the front parts of English omnibuses.

French omnibus.

On some of the French carriages are some pretty specimens of chased metal decorations—silver on gold, and *vice versâ*.

The French especially show a multitude of plans for shortening the distance between the front and hind wheels of their carriages; they mostly consist of arrangements of slots of various shapes and curves, working on two fixed bolts. All such plans cause a rattle soon after being put into use, on account of the wearing of the slots and bolts.

There are also some carriage shafts shown, formed of bundles of cane bound together with wire. The inventor says it is impossible to break them by a horse falling; on the other hand, it is said they cannot be made to retain their shape, and bend too much when in use. Some axles are shown with the grooves in the boxes slightly spiral instead of straight; they catch up any grit which may by chance get into the box, and constantly carry up the oil to the back of the axle when in use. There are also some axles made on an economical plan for common carriages; there is only a small collar to the axle; the reservoir of the box covers it, and keeps out grit; the collett and nut are in one piece, and of iron; the cap to contain the oil in front is of cast-iron.

Shafts.

Some very ingenious machine-worked panels are shown. They represent various patterns of basket-work in excellent imitation, and are used in France for panels of sporting and light carriages. Some economical elliptic springs exhibited are made by turning up the end of the back plate on edge, and passing a bolt through a hole in each plate. They may well be applied to light, common carriages for country use. There are also some well-contrived single and double carriage-steps, opening and shutting with the carriage door.

Panels, springs, and steps.

Many of the French carriages have the spokes of the wheels made of acacia instead of oak. This is a wood which has been extensively used in France of late years for this purpose; the French builders speak very highly of it, and maintain that it is far more durable than oak. The wood brought from the Departement des Landes is considered the best, on account of its toughness and the closeness of its grain; it may be procured from Bordeaux. For light wheels they are using tyres of what they call "acier naturel." What this is I have been unable to ascertain; whether a cast and rolled steel, or iron treated by some method to harden it. It welds as well as iron.

Lord Shelburne on Coach-makers' Work, &c.

Appendix.

The *Messageries Generales* show a military hospital waggon for the conveyance of wounded or sick soldiers. It seems a much more cumbersome affair than those lately made for the British army, and would occupy double the space on board ship. The English carriages for a similar purpose are much lighter, and fold up for conveyance by sea, or for storing away when not required for use.

Hospital waggon.

Harness.

Several harnesses are shown, made in such a manner that the horses may be instantly freed from a carriage; the same remark applies to them as to the plans for detaching horses from a carriage, by apparatus connected with the carriage.

Among the French harness one is shown in which the buckles are replaced by screws and boss-nuts. Another is shown in which the strapping is kept together by screws and flush-nuts instead of sewing. A harness already used two years is shown as a proof of its answering the purpose intended. It seems a suitable plan for common harness.

The chased-metal work on some of the state harnesses exhibited by France, is very beautiful; though they, like some of the carriages, are too elaborate and delicate for actual use.

Ireland sends a harness having a neat plan of superseding buckles. The straps pass through two metal loops, having a projecting pin between them, which passes through a hole in the strap to be attached.

London shows some chased harness ornaments in very good taste.

Holland shows some driving-reins of cord, plaited in a very neat manner.

In the south of France they have an excellent plan of fastening the breechings of horses to the pole pieces, instead of to the collar. By this plan the strain of the breechings in descending a hill is thrown on the horses' hind-quarters only, and not partly on the neck, as in the plan in use for harnessing horses in England.

Belgian railway carriage.

Belgium sends a railway carriage having a compartment in which frames draw out to connect the opposite seats; a cushion can be placed on the frame, and the seat cushion can be so propped up as to form a pillow, thus enabling passengers to lie down in trains travelling by night, or for many consecutive hours. This plan would add considerably to the comfort of passengers, at a trifling expense to the railway companies.

The second-class compartments of all the foreign railway carriages shown have comfortably stuffed cushions and backs, very different from those of the English railway companies, who seem to vie with one another as to which can make their second-class carriages most uncomfortable.

Switzerland.

Switzerland shows two excellent railway carriages; one is on the American plan, having a passage in the centre from end to end. The seats of the first-class compartment are most comfortable, and the seats for the second-class passengers are cushioned, and have stuffed backs.

"Mécanique d'enrayage."

Almost all public carriages on common roads in France, and even the carts and waggons, are fitted with what they call "*mécanique d'enrayage.*" It consists in applying a pressure to the outer rim of the hind wheels in descending hills; the pressure is applied either with a screw or lever. Drag shoes, as used in England, appear to be almost out of use. The plan has the advantage that when a carriage is once fitted with the apparatus it is no longer necessary to stop the carriage on approaching a hill, or after one has been passed, as is necessary in applying and removing an ordinary drag shoe.

Woods suitable for carriage building.

A great variety of useful woods, suitable for carriage building, are shown by the English colonies. The immense consumption of wood for the building of railway carriages, vans, trucks, &c., and also for agricultural implements, has drawn largely on the supplies of ash, elm, oak, pine, and Honduras mahogany, formerly at the command of coach-builders, and renders it desirable to look for new sources of supply. Among the foreign woods are many better suited for their purpose than those of home growth.

The supplies of mahogany from Honduras, and of sound white pine from North America, have of late years been very precarious, and the price has accordingly been high. Several French coach-builders have within a few years used Honduras mahogany for panels, but are now returning to the French

walnut they formerly used. They say that although the mahogany panels keep their form well, the grain of the wood, being more open than that of walnut, does not retain the brilliancy of the varnish so well as the walnut, which has, however, the disadvantage of becoming uneven and puckered if a carriage is much exposed in the sun's rays. It may be possible to procure a wood which shall combine the good qualities of both without their bad points.

Canada shows some excellent specimens of timber; among them the following are very suitable for coach-building:

Woods suitable for carriage building.

For spokes and underworks—Smooth bark hicory.

For panels, footboards, &c.—Sycamore.

For framing—White oak, white ash, and black ash.

For blind frames—Red cedar.

For roofs, bottoms, &c.—Soft maple and lime.

Also dressed hicory spokes, prices from 16½ to 22½ francs per set of 60. Oak spokes somewhat cheaper.

New South Wales contributes an exceedingly well-arranged series of excellent close-grained woods. Among those suitable are—

For roofs, bottoms, &c.—podocarpus spinulosus (pine), ceratopetalum apetalum (lightwood).

For panels—water gum (tristania neriifolia), blue gum (eucalyptus), swamp mahogany (eucalyptus), cedrela Australis (cedar), meliaceæ (rosewood).

For spokes, poles, &c.—cargillia Australis (black plum), acacia binervosa (blackwattle), acmena, acacia, bastard box (eucalyptus).

For framing, underworks, felloes, stocks, &c.—iron bark (eucalyptus), woolly butt (eucalyptus), notœlea, acacia longifolia, teak, rosewood (meliaceæ), mountain-ash (eucalyptus pillularis), blue gum of Camden.

For blind frames—beef wood (stenocarpus salignus).

The woods of the Cape of Good Hope are also of excellent quality. Among the following are suitable:

For panels—yellow wood, pterocelas, Urus rostratus, sneeze wood (Pteroxylon utile), saffron wood (Elædendron croceum), Weinmannia trifoliata, Oreodaphne bullata (stinkwood), Widdringtonia juniperoides.

For underworks—stinkwood (Oreodaphne bullata), assigie, canthium (Cape teakwood), myrsine melanophleos, olea verrucosa, olea laurifolia (black iron wood), olea capensis (ironwood), gonioma kamassi, buddleia salviæfolia.

For spokes, poles, &c.—Halleria lucida, acacia horrida (thorn tree), phoberos mundtii, pappea capensis (wild plum tree), Cape ash (Eckebergia capensis). knobhout (Fagarastrum capense), ochna arborea (redwood), zybast silkbark (celastrus acuminatus), olinia capensis, royena lucida.

For elastic gig shafts—grewia occidentalis.

For bending—karreehout (Rhus viminalis, Vahl).

For framing, felloes, &c.—cassine colpoon, schotia tamarindifolia, hassagay (Curtisia faginea), gardenia thunbergia, gardenia rothmannia, plectronia ventosa, kreupelboom (Leucospermum conocarpon), niebuhria Caffra.

For blind frames—lepelhout (Hartogia capensis).

For roofs, bottoms, &c.—kafir tree (Erythrina Caffra).

The pamphlets describing the woods of New South Wales* and the Cape of Good Hope† are most useful publications, and explain at once to practical men almost all they want to know as to the general character of the woods they describe. It is to be hoped that specimens of these woods will be collected and retained in some convenient building in London for inspection, with the names attached. The manner of showing the woods of New South Wales in large

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* Australie: Catalogue des Collections de Bois indigènes des différents districts de cette Colonie. Par MM. Macarthur, Commissaire envoyé à Paris pour l'Exposition de 1855, et Ch. Moore, Directeur du Jardin Botanique de Sidney. Paris: imprimerie Horticole de J. B. Gros, Rue des Noyers, 74.

† Silva Capensis, or a Description of South African Forest Trees and Arborescent Shrubs, used for Technical and Economical Purposes by the Colonists of the Cape of Good Hope. By L. Pappe, M.D. Cape Town. Van de Sandt de Villiers and Co., Castle-street, 1854.

LORD SHELBURNE ON COACH-MAKERS' WORK, &c.

Appendix.

pieces gives an opportunity of judging of the average diameter of their growth, as also of the description of bark grown on each specimen.

Van Diemen's Land, Bahamas, Victoria, Spain, Tuscany, Pontifical States, Jamaica, Mauritius, and Algeria also show excellent hard woods.

Bengal shows specimens of many excellent hard woods, but for want of arrangement and classification little information could be obtained respecting them. The acacia catechu seems suitable for panels.

British Guiana shows woods suitable for panels. They are locust wood, ducaballi, swedani, purple heart; also many others fit for spokes, under works, &c.

Ceylon shows some boxes made of a wood which looks as if it would furnish excellent panels.

It is said that British Honduras can furnish many excellent woods besides the mahogany exported so largely.

Bengal shows a specimen of fine long lustrous hair, as also some silky-looking vegetable fibres, suitable for parts of carriage laces.

Conclusions.

It may be said, in conclusion, that England excels foreign countries in a marked manner, in the convenience and variety of the kinds of carriages made; in the simplicity and soundness of their construction; their durability and their capability of resisting the effects of climate, whether hot or wet; their axles, springs, carpets, floor-cloths, leather and cloths are superior to those used by foreign builders. Very few materials, with the exceptions of vermillion and ultramarine blue, are procured from the continent of Europe.

The French may be said to excel in the brilliancy of their varnishing; this must be attributed to their dry, clear air, as they, as well as most other continental builders, use English varnish in preference to any other. Their silks are somewhat richer than the English, and the linings are generally more richly got up than the English; they have also very tastily designed and chased metal ornaments. Their hammercloth trimmings excel the English; few persons in this country will afford the expense which seems readily incurred for such articles in Paris. Their carving is excellent; but for ordinary plain carriages is apt to get clogged with dirt, and to make a carriage look shabby unless thoroughly cleaned. Their iron work is exceedingly well forged and filed.

They procure various articles from England, preferring them to those made in France, viz., carriage designs, varnish, spring steel, carpets, painted floor-cloths, wool rugs, files.

They have an excellent plan of preserving the pattern of the outline of their carriages by drawing them on brown paper of very large size; when not in use, the paper can be readily rolled up and put aside. They line many carriages with worsted velvet. It forms an elegant interior, and is very warm and comfortable for winter use. It is to be regretted that no English carriage axles are shown, as they are made of excellent quality, and now at a moderate price. Being up to the present time prohibited entry into France is probably the cause; but until the French either produce or procure well-made axles, their carriages will not roll along as soundly and as quietly as English carriages. The English show no plan for detaching restive horses from a carriage against the numerous plans shown by the French. It may be, perhaps, inferred from this circumstance, that drivers in England rely more on nerve and self-possession with restive horses than on makeshifts to get rid of their charge on the outbreak of hostilities.

System of jobbing carriages.

The system of jobbing carriages for a term of years, so largely carried out in England, seems to be unknown in the same form abroad. "Loueurs de voitures" certainly furnish carriages on hire, but always with the addition of horses, harness, and coachman, having generally the air of a hired turned out; whereas great numbers of the best private carriages in England are built to the order and taste of the party using them, jobbed for a certain term of years, and kept in good repair for a fixed annual payment.

Carriage committee appointed by the Board of Trade.

The plan pursued by the Board of Trade of this country, in appointing a committee to carry out the arrangements for a creditable show in each trade, seems to have been successful in this department. Each of the English carriages is built for use, as well as show, and is ready to be put into immediate work at the close of the Exhibition; whereas a great proportion of the continental carriages,

more especially the French, are specimens of a sort of "cramming" for the desired prizes.

The formation of the jury for this class seems to have received only slight attention from the Executive, as it does not contain among its members a single practical coach-builder. How far their awards will be appreciated by the public and the exhibitors remains to be proved; impartiality almost amounts to an impossibility, when some at least of the jury are not practically acquainted with the details of the manufacture of which they undertake to weigh the merits. The exhibitors and manufacturers can easily judge of what carriages deserve favourable notice.

I can only regret that the examination of this department was not confided to one more competent than myself. Many omissions will be detected, but a limited stay in Paris may be pleaded in extenuation. My thanks are due to Mr. Logan and Mr. McArthur for the information furnished by their departments; as also to Mr. Audley for according me permission to make notes in the Exhibition building.

*** Since these notes were drawn up, the list of awards has been published. The awards and their classification for this department are very eccentric. It is difficult to guess what principle has guided their selection; a feeling, however, exists among many British exhibitors that the original awards of the Jurors have been considerably altered by the Committee of Revision appointed since the dispersion of the Juries.

On Prepared and Preserved Alimentary Substances.

By Professor Owen, F.R.S., Chairman of Jury for Class XI., Preparation and Preservation of Alimentary Substances.

To the Right Hon. The Lord Stanley, of Alderley, President of the Board of Trade, &c. &c. &c.

My Lord,

In compliance with the request of the Board of Trade, for a Report on the class of objects on which I acted as Juror in the Paris Exhibition of 1855, in reference to the progress made in that class since 1851 as bearing upon the position which the United Kingdom held in the Paris Exhibition, I have to state that the class to which I was attached was No. XI., "Preparation and Conservation of Alimentary Substances;" in Group III., "Trades based especially on the use of physical and chemical Agents, or relating to Sciences and Instruction."

Articles of food; superiority of the United Kingdom in their production.

In regard to the production of Articles of Food, the true position which the United Kingdom of Great Britain and Ireland holds, in comparison with other civilized countries of like extent, is well known, and its superiority in this respect is generally acknowledged.

But this superiority is manifested by the exhibitions of the Raw Materials at our agricultural meetings, rather than in those expositions of the industrial procedures which illustrate the arts of preparing and preserving articles of human food; and the productiveness, in this respect, of the United Kingdom was not brought out in the great Paris Exhibition of 1855.

Acts as a check upon the art of preserving them.

Perhaps the very success which, in Great Britain, has attended the experimental improvements in agriculture, as illustrated by the increased quantity of cereals and of fattened cattle,—of grain and meat,—from a given extent of land, may have operated as a check on the experimental skill and inventive spirit, which in other countries have been exemplified in the arts of preparing and preserving animal and vegetable substances; just as the extent and productiveness of our tropical colonies have never permitted that stimulus of want to arise, which has operated so remarkably in France in the application of the resources of a refined chemistry to the obtaining of sugar from other plants than

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the sugar cane (*Arundo saccharifera*); as, for example, the maize, the maple, the *Sorghum saccharinum*, and especially the beet root, which are cultivable in temperate latitudes.

Flours, starches, &c.

The first section of objects in the Paris Exhibition, collected under Class XI., consisted of "Flours, Meals, Starches, and their Derivatives."

In this section the United Kingdom had six exhibitors.

Messrs. Buck and Son, of Bradford and Bedale, Yorkshire, exhibited specimens of wheat-flour and oatmeal, both of which, and the latter more particularly, showed that fineness and evenness of quality which obtained for the same exhibitors a prize-medal in 1851.

Not any of the other London exhibitors who obtained prizes for various series of flours in 1851, sent examples of their products to Paris, and consequently the superiority of the French in this respect, which obtained for M. D'Arblay (of Corbeil, Seine and Oise,) the council medal in 1851, for his famous gruaux wheat-flour, remained undisturbed.

Wheat.

In M. D'Arblay's establishments the harder kinds of wheat, chiefly Sardinian, Sicilian, and Russian, are ground; and by means of the adjusting process there applied, the grains are first ground high in the mill; the white middlings are then separated by coarse sieves and reground low in the mill; finally, the flour is repeatedly passed through fine silk sieves. In the manufacture of these sieves the French excel; and the superior fineness of the French flour, so well adapted for patés and the like culinary preparations, in great measure depends upon that important part of the flour manufactory.

Gruaux principle of grinding.

By the combination of the superior sieves with the gruaux principle of grinding, the wheat flour may be made to contain more or less gluten in proportion to starch, and a saving of the finest and most nutritive portion of the flour is effected.

There was no evidence in the British Department of the Paris Exposition of any improvement likely to render us less dependent upon France for the peculiarly fine kinds of flour, which continue to be extensively imported for the purpose of mixing with and bettering our inferior flours.

The gruaux principle of grinding is well worth the attention of the Australian colonists; the hard wheats of that climate most resembling those kinds of European wheat which M. D'Arblay finds best adapted for the application of his principle of flour grinding.

Lentil meal.

In regard to the specimens of "gram," or lentil meal, exhibited in the collection of the agricultural produce of Egypt, No. 1, 3rd Class, this product of the decorticated seeds of

the pulse, called, botanically, *Ervum lens*, has been forced of late upon public attention in Great Britain (which it merits by reason of its nutritive and refreshing qualities) under the name *Erva-lenta;* and the recognition of those qualities has led to the subsequent extensive advertisement of a slightly modified material, under as slightly modified a name, viz., "*Revalenta*," with the addition of the word, "*Arabica.*" Analysis of the latter form shows that a small proportion of peasmeal, maizemeal, oatmeal or barleymeal, with about a hundredth part of common salt, is added to the "gram," or lentil meal, which constitutes the chief basis of the *Revalenta Arabica* of Barry, as it does in a purer state the *Ervalenta* of Warton. Both kinds might be sold, and their nature be better understood, under their proper name of "Lentil Meal;" but, in that case, the public, as my excellent colleague, M. Payen, has remarked, might purchase it elsewhere and at a cheaper rate than from the rival advertisers of the Ervalenta and Revalenta.

Starches and starch gums.

There are two exhibitors of starches and starch gums, or dextrine, in the United Kingdom, No. 690, Messrs. Brown and Polson, and No. 693, Messrs. Wotherspoon, both of Paisley. The excellence of the bleached starches of No. 690., consists in their being more completely soluble than usual; but there did not appear to be any starch superior to that prepared from sago by Messrs. W. Wotherspoon. Not any of the English rice-starch manufacturers who obtained the prize medal in 1851 competed in the Paris Exposition; but the French Medallists of 1851, Messrs. Steinbach, No. 3323, M. la Bleis, No. 3289, and M. Verou, No. 3330, showed that their starches had lost none of the excellence for which they received rewards in 1851. From the samples sent by other exhibitors in the Paris Exposition, the French at present appear to excel in the art of preparing and modifying the starch principle of the potato, so as to simulate the principle of the *Maranta arundinacea*, called, under one form, "arrow-root," and under another or granular form, "tapioca;" as also to simulate the starch principle of the *Cycas circinalis*, called "sago," and that of certain Asiatic species of *orchis*, called "salep." It must be added, however, that the conscientious fabricators of these imitations vend them as "French" or "indigenous arrowroots, sagos," &c., and at a lower price than that for which the genuine exotic article can be obtained.

Biscuits.

Two exhibitions of biscuits were sent from the United Kingdom, one from BOLAND of Dublin (No. 689, ship-biscuits), the other from HUNTLEY and PALMER of Reading (ship and other kinds of biscuits). The effective machines

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by which the Reading biscuits are prepared are exhibited by Messrs. Barrett and Co. in the 6th Class, No. 278. These, and other machines connected with the preparation and fabrication of alimentary substances, will come into the Report of another Jury.

Ship biscuits.

Excellent examples of ship-biscuit are exhibited in the Department of Canada by ROBB, (No. 203,) who obtained a prize medal from those articles in 1851, by FITTS, No. 189, by LAWSON, No. 194, and by NAYSMITH, No. 199; in the Australian Department, by HAMILTON, No. 146, by WILKIE, No. 154, and by PESCODD and Sons of Van Diemen's Land, No. 51.

In regard, however, to the combined qualities of purity, compactness, durability, facility of stowage, and cheapness of ship-biscuits, there is no evidence from the United Kingdom exhibitors, of any advance having been made since 1851.

Confectionery.

The English exhibitors of lozenges, comfits, and liqueur bonbons, Messrs. Wotherspoon, No. 713, and Messrs. J. Schooling, No. 715, who obtained respectively the Prize Medal and honourable mention in 1851, have shown the same smooth, well crystallized, and purely flavoured articles as in the London Exhibition. The name "French sweetmeats," by which these confitures flavoured with artificial essences are known in the trade, indicates the origin of the industry, which is richly and admirably illustrated in the French Department; but the ingenious machinery respectively employed by the British exhibitors above mentioned, and that of which models are shown by Mr. Weatherley, No. 712, enable our own manufacturers to equal the French in the quality of the article, and surpass them in the cheapness with which it can be supplied.

Preserved fruit.

Messrs. Batty, who gained honourable mention in 1851 for their preserved fruit, exhibited under No. 696 similar articles of equal excellence, together with condiments and sauces. The British Prize Medallists of 1851 in this class of alimentary products have not exhibited at Paris; and there is no evidence of any special progress in that class having been made by the confectioners of the United Kingdom.

Preserved vegetables.

There are no examples in the United Kingdom Department of preserved vegetables comparable to those exhibited by Chollet and Co., No. 3,572, and prepared, like those, by combined pressure and desiccation, according to the methods invented by the head gardener of the Imperial and Central Society of Horticulture of France, and known in that country as the "Procédé Masson."

A rapid desiccation of the most bulky and succulent vegetables is effected by currents of hot air, regulated so as to avoid coagulation of the albumen, or dissipation of the essential oils and other principles upon which depend the savour and colour of the plants. The further diminution of bulk is effected by a hydraulic press, by which the vegetables are reduced to about eight-tenths of their natural size, and to about seven-eighths of their original weight. The vegetables thus prepared are divided into angular plates of fixed dimensions corresponding to one or more rations.

Process employed.

In this state, when properly packed in dry casks or tanks, as ship-biscuits are, all kinds of soft and succulent edible vegetables can be preserved for years, and are readily transportable by sea or land to any distance.

Previous to cooking, the tablets must be soaked, either in cold water for from six to eight hours, or in warm water from four to six hours;* whereupon the vegetables resume their original size, their shape, and more or less of their colour; they then need only to be cooked like fresh vegetables.

The importance to the health of ships' crews and troops of a proportion of succulent or green vegetables being combined with the salt,—or otherwise preserved,—meats renders the discovery of M. Masson, as perfected and carried out on a large scale by MM. Chollet and Co., of great importance to national victualling offices and commissariats.

Cocoa and chocolate.

The same exhibitors who obtained Prize Medals and honourable mention for preparations of cocoa and chocolate in 1851, have contributed specimens of their skill in this line to the Paris Exhibition; and amongst these, Messrs. Fry and Co. retain their superiority in regard to the variety of ingenious modifications of the nutritious parts of the cocoa seed and nib (*Theobroma cacao*).

This species of alimentary manufacture is on the increase in France; large establishments with machinery of the most ingenious description in the neighbourhood of Paris were inspected by Jury XI.

Some of the products were varied by delicate additions of aromatic savours, as vanilla, *e.g.*; but, in general, the proportion of sugar in the French chocolate is greater than is agreeable to the English palate.

Alimentary substances obtained by fermentation.

In regard to the alimentary substances obtained by the fermentation of vegetable saccharine juices, the quality of the productions of British breweries, known as porter, stout,

* The restoration of their evaporated juices by long boiling, as recommended in the Jury Report of 1851, p. 64, is to be avoided.

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pale and bitter ales, &c., is well known, and they have a world-wide reputation. They were not exhibited or exemplified in the Department of the United Kingdom, but were habitually and extensively tested by visitors of all nations in the refreshment-rooms attached to the Parish Exposition.

Wines of New South Wales.

There were no British exhibitors of wines of any description; but, amongst the British colonies, Australia gave evidence of the rapid development and growing importance of the vineyards in New South Wales, in the specimens of wines exhibited by Messrs. Macarthur, King, and Brown.

These wines included white wines, akin to those of the Rhine; red light wines, like those of Burgundy; Mousseaux varieties, with a bouquet and body-flavour equal to the finest champagnes; Muscats and other sweet wines, rivalling the Frontignac of the Cape.

Some of these wines were of the vintage of 1839, bottled in 1842; others had made the voyage round the world in wood.

The verdict of the "Experts" employed by Jury XI. was much in their favour; for whereas in the wines of Europe the numbers indicative of quality ranged from as low as 2 to 18, the lowest number assigned to the Australian specimens was 7, the highest 15, and the average number was 11½, being as high as that of the wines of Austria, and much exceeding that of the wines of the Cape, or of any other of our wine-producing colonies.

Austrian wines.

Whilst alluding to the wines of Austria, including the Hungarian growths, it may not be wholly out of place here to testify to the excellence of the various kinds of wines exhibited in the Austrian Department, and to the importance, especially in reference to the recent spread of the grape-blight in Madeira, Portugal, the sherry districts of Spain, and some parts of the south of France, of encouraging the importation into the United Kingdom of the pure, unbrandied, cheap wines of Austria. The quantity of wines produced in that country, and chiefly for home consumption, now amounts to 2,000,000,000 of gallons annually; its vineyards are susceptible of an increase sufficient to supply a vast exportation.

Prices of the wines of New South Wales.

Mr. Macarthur informs me that dry white wines from Australia, such as Riesling, or red wines, may be obtained in London, duty paid, at three years old or less, at about 24*s.* per dozen; also Muscats, either white or rosy, new, duty paid, at about 30*s.* per dozen; less duty, they would be about 18*s.* and 24*s.* respectively. The above will probably be the prices for a batch of Australian wine now in London, and about to be bottled. It is not possible to say that they will

be precisely the same as the wines exhibited, because they are the growth of subsequent years, but at the same ages they may be better. In giving the foregoing prices it is not possible to estimate absolutely the London expenses of landing, gauging, storing, and bottling. This statement is founded upon the cost of the wine when delivered to the ship at the Port of Sydney, which is in wood, at the rate of 10*s.* per dozen for the dry wines, and 16*s.* per dozen for the Muscats.

Solidified milk.

With the exception of the solidified milk exhibited by Fadeuilhe of London, No. 699, there is no example in the British Department of preserved alimentary substances from the Animal Kingdom. The above cited solidified milk presented the same qualities as were noticed in the Jury Report of 1851.

Instance of important progresss since 1851.

An interesting and important evidence of progress since the Great Exhibition of 1851, and as the result of that competitive assemblage of the products of different nations, may here be noticed, although it relates to a British colony and not to the United Kingdom itself.

Russian isinglass.

Of the specimens of the gelatinous substance called "isinglass," (colle de poisson, Fr.) exhibited in 1851, those from Russia displayed the best quality. The Russian isinglass is obtained from species of sturgeon, chiefly from the *Acipenser Huso.* It is the main tissue or substance of the air-bladder of the fish, and its peculiar value in commerce depends upon the peculiar organization of that tissue, by which it separates by maceration into very fine fibres, capable of operating mechanically in the clarification of white wines and malt liquors. For this purpose isinglass cannot be superseded by gelatine obtained from other animal substances, and Russia has been hitherto the chief source of supply of isinglass to France and England.

Canadian isinglass.

The air-bladders of some species of East Indian fishes, the *Polynemus plebeius*, for example, afford an isinglass almost equal for clarifying purposes to that from the sturgeon. Species of sturgeon abound more or less in the great rivers and lakes of Canada, but no example of isinglass was exhibited by Canada in 1851. The attention of the Commissioner was called to the fact, and the requisite information as to the mode of procuring and preparing the air-bladder of the sturgeon was imparted to him. In the admirably selected and arranged objects in the Canadian Department in the Paris Exposition good examples of islinglass from the sturgeons of the colonial waters were shown, *e.g.* by Mr. Lyman, of Montreal, No. 179.

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It is most probable that the natural source of isinglass is as abundant and as available in Canada as in Russia; and it is desirable that the colonial authorities should encourage and afford the means of instruction to the colonists in the vicinity of the lakes and rivers in the capture of the sturgeons and the preparation of the air-bladder, according to the modes of obtaining the best Russian isinglass.

Preserved meats.

Good examples of preserved meats were shown in the Colonial Department of the Paris Exhibition, as from Canada, for example, by BAUDEN, No. 187, and MACHRIE, No. 197, and in the Australian Department, by BUCHANAN and DANGER.

Meat biscuit.

The economical and efficient form of concentrated food exemplified in the American meat-biscuit of Gail Bordeu, exhibited in the London Exhibition in 1851 (Reports of Juries, p. 65,) has elicited no attempts in this country, so far as the evidence of the Paris Exhibition goes, to succeed or surpass in similar modes of preparing alimentary substances in this country.

French "biscuit-bœuf."

In France, however, M. Beurmann, No. 3,827, now manufactures a concentrated nutritive compound, under the name of "biscuit-bœuf," which closely resembles the meat-biscuit of the Texas.

This biscuit-bœuf has attracted the attention of the French Commissariat Department, as appeared by the certificate of General de FEUCHÈRES, inspector-general of troops, of the General of brigade, MYLINS, and of the officers of the 55th regiment of the line, appended to M. Beurmann's prospectus.*

Its preparation.

The following is the sum of what I have been able to learn relative to the preparation of the meat-biscuit. The quarters of beef, immersed in a quantity of water sufficient to cover them, are subjected to a long and slow ebullition. The liquid, after the fat has been skimmed off, is evaporated to the consistence of syrup; it is then incorporated with fine wheaten flour, in quantity sufficient to give it a consistence capable of yielding to the rolling-pin. When rolled out to the thickness of an ordinary ship-biscuit, the cake is pricked and cut into the angular form best adapted for stowage; the meat-biscuits are then baked in the oven, are thoroughly dried, and packed for exportation.

They can be eaten as biscuits in the dried state, and this is the great value of them to the soldier when in the trench

* Reference is made to M. Ponteau as the inventor of a meat-cake, by Mr. O'Brien, in his work "The Danubian Provinces."

or on the march; but they afford a more sapid and comforting kind of sustenance if they are broken up in about 20 times their weight of water, and, with the addition of some salt or other condiments, boiled for 25 or 30 minutes. An excellent and most nutritious soup is thus readily obtained.

Vegetable tablets,

Of the successful applications of human ingenuity and skill to the concentration and conservation of nutritive substances as exemplified in the Paris Exposition, the dried vegetable tablets according to the Procédé MASSON, and the meat-biscuits of GAIL BORDEU, appeared to me to best deserve the attention of the Government in regard to improvements in the supply of Her Majesty's fleets and armies.

Conclusion.

In conclusion, on a review of what has appeared to me worthy of record during the experience of my jurorship in the Paris Exhibition, I may be permitted to remark, in reference to the brevity and seeming baldness of the foregoing summary, that a report must necessarily bear relation to its subject, and that in no class of objects was the United Kingdom so inadequately represented by exhibitors as in Class XI., that of "Prepared and Preserved Alimentary Substances."

I have the honour to be, &c.

RICHARD OWEN, F.R.S.

Hunterian Professor of Physiology in the Royal College of Surgeons of England, Chairman of Jury XI., Paris Exposition.

30th November 1855.

On the Position which certain Classes of Birmingham Manufactures held in the Universal Exhibition of 1855, when compared with similar Productions exhibited by France, Belgium, Austria, Prussia, &c.—By George Wallis.

To the Right Hon. the Lord Stanley of Alderley, President of the Board of Trade, &c. &c.

Society of Arts and Government School of Art, Birmingham.

My Lord,

Introduction.

In considering the position taken by the special industries of Birmingham, and the manufacturing district around it, inclusive of Wolverhampton, in the Universal Exhibition held at Paris in 1855, the tendency to refer rather to what the manufacturers of this locality are constantly doing for the supply of the ordinary markets of the world, renders it almost impossible to confine this report to the consideration merely of the articles exhibited; since these latter did not represent in a systematic manner the true position of the manufactures of Birmingham, except in a comparatively few instances.

Important branches of industry may be said to have been unrepresented, whilst others were so meagrely illustrated as to suggest comparisons leading to the most erroneous conclusions, as to the more recent improvements in particular specialities. It is therefore necessary to keep this fact in view, in attempting a summary of the comparative position held by those departments of British manufactures which come within the scope of this report, and that taken by the French and other continental industries of a similar class. This is the more imperative, since if by the neglect, supineness, or absolute disinclination to exhibit on the part of those engaged in the production of useful articles, important to the manufacturing and commercial position of England, that position has been apparently compromised, it is desirable that any misapprehension as to the true cause should be corrected as far as possible, and the apathy of individuals not be allowed to be confounded with lack of power, or adduced as evidence of a decline in the hitherto acknowledged excellence of the numerous and varied branches of manufactures carried on in Birmingham and its vicinity.

MR. WALLIS ON BIRMINGHAM MANUFACTURES.

Disinclination of manufacturers to exhibit.

Singular as it may appear, this very disinclination to exhibit really arises in many instances from a consciousness on the part of the manufacturer that he is progressing in his special department of industry. His "Order Book" is well filled, his engagements are as numerous as he cares to enter into, and inasmuch as he regards all improvement in construction and design, as also in modes of manufacture, as his exclusive property so long as he can succeed in retaining these advantages, the inducement to expose his productions is too small to influence him to any considerable extent. Thus in many branches of the staple manufactures of Birmingham, the disinclination to contribute to the Universal Exhibition, did not arise so much from any apprehension as to the results, but it is feared arose out of a lower motive; a jealousy that improvements may become known, patent methods exposed, and rivalry invoked, where exclusive privileges had become a custom, or were regarded as a special benefit. Yet the fact was overlooked, that the very articles it was desirable for the national honour and the future progress of British industry should be exhibited and compared side by side with those of our commercial rivals, were daily sold in the markets to the very persons it was deemed by the producer so imperative should be kept ignorant of their existence!

Improvements since the Great Exhibition of 1851.

Without presuming that in the more ornate departments of the great staple metal trades of Birmingham, a very high position would be taken, it was not unreasonable to expect that in certain branches, examples would be shown which might be conducive to a better understanding on the part of our continental neighbours, of the real merits of those industries in an utilitarian point of view; and that at least certain marked improvements effected since the Great Exhibition of 1851, would have been fairly illustrated. This, everyone had a right to look for in the specialities of gas-fittings, chandeliers, &c. in which a purer taste has certainly been at work during the past two or three years. Nor can the importance, commercially, of those useful articles metallic bedsteads, be overlooked, since the display of such examples of this class as are daily produced in Birmingham would have been likely to have been more highly appreciated in France than in any other country, from the constant demand for analogous pieces of furniture created by the habits of the people; especially in the light, cheap, and less ornate kinds. When it is remembered, however, that not a single specimen of a branch of industry which has risen within a comparatively few years to so much importance, was contributed from Birming-

Metallic bedsteads.

ham, and that the examples exhibited by the French were either so over ornate or so utterly void of the true essentials of a metallic bedstead, as to irresistibly provoke a comparison with the articles which Birmingham manufacturers ought to have contributed, but did not, it will be at once seen, that the Exhibition was singularly defective in a point where British skill, ingenuity, and handicraft power might have been displayed to great advantage. An opinion, however, unfortunately prevailed amongst manufacturers, not only of this class of productions, but of others, that unless they were prepared to expend much money and valuable time upon the getting up of special works (*tours de force*), it would be better that they should not exhibit. Unfortunately, the awards of the juries have done much towards proving the accuracy of this opinion; a result to be deprecated, since it is out of the improvement of manufactured articles in every day demand, that all sound progress must come.

Chandeliers, gasbrackets, &c.

In chandeliers, gas brackets, girandoles, &c., the contributions were in some few instances worthy of the recent efforts after a purer style of ornamentation, but in others they were simply illustrative of that incessant following of French design which has been the characteristic of this branch of trade for so long a period. Compared with works of the same class exhibited by the French, there can be no doubt that in point of actual workmanship, in strength, and mere manipulative form, they took a good position. In intelligence as regards the adaptation of the parts to a given *ensemble*, however, it was but too evident that the English workman had not always known what he was about, and certainly in an artistic point of view he had seriously overlooked obvious advantages in the use of his materials. Few things are more striking than this lack of *judgment*, otherwise *taste*, in the arrangement of nearly the same materials. In the French productions no work is thrown away. Be the materials of the composition more or less, the most is made of those materials; and however superabundant the ornamentation may be, it is always put forward in that form which will give it the most effect. In girandoles, table lights, &c., the contrast in this respect with similar productions from Birmingham was remarkable; nor indeed could it be said that either the Austrian or Prussian works of the same class approached the French in this absolute use of every point.

The recent tendency of the continental manufacturers to the use of a variety of materials such as glass, porcelain, &c.,

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as ornamental adjuncts to works in metal has not as yet influenced English productions of the same class to the extent that might have been expected. In cases where opal or crystal glass has been introduced in the latter, it has been generally with more judgment than usually characterized the Austrian and Prussian specimens exhibited at Paris, in which the commingling of a variety of materials of widely different effects, when seen in the same light, produced results of a very *bizarre* character. The French examples were certainly less open to this objection, but the integrity of the material in the best specimens produced in Birmingham is far preferable to the factitious effects obtained by these contrasts.

Chandelier from St. George's Hall, Liverpool.

In no respect could this be better illustrated than in the chandelier exhibited by the Corporation of Liverpool, being a specimen of the series manufactured by Messrs. Messenger, of Birmingham, from a design by Professor Cockerell, R.A., for St. George's Hall, Liverpool. The slight variation of the light bronze tone which characterized the whole, gave full effect to the forms alike of construction and decoration, and the work was seen as a whole. The result thus obtained being far preferable to the startling effects produced by the varied tones of bronze introduced into some of the larger works of the French exhibitors; although there is no reason why this contrast of colour in the same material should not be used at times to great advantage, especially in large works, since if judiciously applied greater variety, without loss of integrity, may be obtained to assist forms which might otherwise be objectionable for want of contrast. Parts would thus be better pronounced, whilst still forming part of a consistent whole, and the great elements of all ornamentation, "*spot*" or "*line*," be kept up without the violence resulting from a heterogeneous mixture of materials.

The principle, however, that the excellence of the design ought to depend upon the construction and the ornamental forms growing therefrom, quite independent of contrast in colour or material, cannot be too strongly insisted upon, and although the Birmingham contributions of this class, with few exceptions, did not show that very strict attention was being paid to this point, yet it is only just to state that in the best manufacturing houses engaged in the chandelier trade of Birmingham, there is now a healthy tendency to keep this point in view. In fact, greater simplicity and purity of construction as adapted to use, and of ornamentation as adapted to construction, is gradually taking the

Value of simplicity in design.

place of the ultra ornate absurdities of past years. In fact, manufacturers begin to find out that artistic talent duly directed by practical skill *pays*, and that an expenditure at the outset, which secures elegance and simplicity in design, will frequently more than pay for itself in the *weight of metal* saved in its repetition in manufacture.

As respects absolute excellence of workmanship and utility in construction, the specimens of brass foundry of Birmingham manufacture in all its branches, plain and ornamental, were quite equal to the best continental work, and for the most part superior in all essential points. It was thus quite clear that the habitual skill of the English workman in his own speciality had carried him through without that effort which was often visible in the better class of continental productions. The contrast was especially marked between the cheaper specimens of French gas-fittings and those of a similar class manufactured at Birmingham. In the former the lack of handicraft power in the working parts was very manifest, the "dressing" and "fitting" being frequently rude and unworkmanlike. It must be borne in mind, however, that the finish of these essential parts in the better class of work was certainly as unexceptionable as could be desired; thus showing that the defects which existed in the best specimens exhibited in the Exposition of 1844, and were still visible in the Great Exhibition of 1851, are in the course of correction, since the skill in the higher class of work will inevitably descend to the lower in due course.

Metal chasing.

A close examination of the various classes of metal work, and a careful consideration of the skill displayed in each, according to its requirements, afforded unimpeachable evidence that in all the leading points the French specimens stood in the first position. The Birmingham work was generally good, but somewhat mechanical. The special care taken in the execution of some of the best examples was but too evident when contrasted with ordinary work of the same class. The Austrian and Prussian specimens, though generally good in special instances did not come up to the general English standard, which of late has certainly been higher than formerly. The peculiarity and excellence of French chasing is its freedom, and the intelligence with which the workmen render the details, and this, too, without apparent effort. Some of the best Birmingham specimens showed symptoms of this quality, but they were exceptional. The metal mountings, &c. of a cabinet exhibited by Messrs. Graham and Jackson, of London, also illustrated this; the

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chasing having been executed mainly by English workmen in the employ of the branch house of Messrs. Cope and Collinson, of Birmingham. In some of the Prussian works great reliance appeared to have been placed on the excellance of the casting. In this respect they resembled American work of a similar character. Nor is this to be wondered at, when it is remembered that the best workmen in the United States in this department of industry are either Germans or Americans trained under German workmen.

Stamped brass.

In stamped brass or "shell" work there were comparatively few specimens from Birmingham. The best were in the undipped state in which they came from the die, being examples of an application of stamped work to the manufacture of ceiling flowers, &c. These specimens were of an excellent character, and well adapted to the purpose for which they were intended, from their lightness, and the ease with which they may be fixed.

The Prussian exhibits consisted chiefly of cornices, frieze ornaments, and mouldings, and partook very much of the character in design now nearly exploded at Birmingham. As regards quality of work, the standard which characterised the specimens exhibited in 1851 still prevailed, the "shell" being very thin, and at times defective. Comparing the best German and French examples with the best work produced at Birmingham in the ordinary course of trade, but of which there were no contributions, there can be no doubt of the general superiority of the latter. Nor does this conclusion apply simply to the workmanship and finish, but in a great measure to the designs also, especially in such articles as cornice-pole ends and curtain bands.

As a special application of stamped work to what, artistically, may be considered a higher use; a few French productions may be quoted. One example consisted of a head of the Saviour stamped in portions convenient for soldering. The result was satisfactory as a special effort, and particularly suggestive of an extended use of "shell" work to the production of figures in which the design and treatment are intelligently adapted to the conditions of manufacture. The work would, no doubt, be very costly, therefore its value commercially may be doubted; since stamped work can only be economically produced in those cases where large quantities of the same forms or repetitions of the same pattern are required.

Miniature frames in ormolu.

The progress of die work in France was further illustrated in its application to the manufacture of spoons and forks, by an analogous process to that of Krüpp, so extensively

carried on at Birmingham by Messrs. Elkington, Mason, and Co. An interesting application of the same method to the production of miniature frames of a highly ornamental character, for daguerreotypes, &c., in ormolu, afforded proof of a continued advance in industrial die-sinking in France. The results obtained were at once tasteful in design and artistic in execution. In the latter respect they were very much in advance of the same class of work as executed at Birmingham; the hand-power of the workman being evidently directed by considerable intelligence, as shown in the care with which details, which in English practice are often neglected, were worked out. As the chief process by which these miniature frames are produced is very economical, when the demand justifies the production of large quantities, the prices may be reasonably expected to be comparatively low; but of this no evidence was given in the Exhibition.

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In the speciality of brass door-furniture, cabinet brass foundry, &c., as manufactured at Birmingham, there was the same lack of completeness, when considered as an illustration of the extent to which these useful articles are manufactured at Birmingham, as unfortunately existed in other important industries. It is gratifying to know, however, that those exhibited were quite sufficient to sustain the reputation both of workman and manufacturer; since, with the exception of some of the best specimens exhibited by France and Belgium, there was little which could be said to compete with the British display, limited as it certainly was.

Brass door-furniture, cabinet brass-foundry, &c.

It might be well, in connexion with the question of cabinet brass work, to allude to the very admirable examples of metal mountings for coffres, furniture, &c. exhibited in the Austrian department of the Palais de l'Industrie. These were highly suggestive to a certain class of Birmingham manufacturers, and although the specimens shown were used in connexion with fancy woods, yet with judicious adaptation they were equally well calculated for mountings of papier mâché articles of an analogous class. The usual mistake in the design and construction of modern metal mountings for cabinet work,—excess of ornamentation, elaboration of detail, or over projection in relief,—was, in most instances, carefully avoided in these Austrian specimens, and simple forms of a strictly metallic type and protective character adopted and carefully carried out.

Amongst the more useful articles of French production in brass it is desirable to notice a very remarkable collection of

Brass pipe joints, taps, &c.

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various sizes of brass pipe-joints, taps, &c. manufactured by Messrs. Détouret and Broquin, of Paris, and exhibited in the Annexe of the Palais de l'Industrie. Some of them were of large dimensions, and the whole were admirable specimens of workmanship; plainly proving that great attention was being paid to the question of finish in the less ornate and more useful articles of French manufacture. London and Birmingham might produce articles of the same class probably quite equal to those above named, but it is doubtful if they could be excelled.

Fancy metal work.

In articles of fancy metal work some of the more useful examples of Birmingham manufacture presented features which placed them far above similar works as exhibited by France and other countries, so far, at least, as good workmanship and a perfect adaptation to special use is concerned. This was especially noticeable in match-boxes, taper-stands, pocket ink-stands, and articles of a similar class. In ornamentation, however, the success was equivocal, even in the best specimens, and in many instances the result in this direction was simply ridiculous. It was only when the work was left as plain as possible that the true merit of the handicraft was fairly seen.

Metal buttons.

In the metal buttons contributed by the Birmingham manufacturers there were examples of great excellence and occasional novelty. The Prussian specimens of the same class were shown to greater advantage, being arranged with more taste, and thus rendered more attractive as a whole. On examination, however, they did not lead to the inference that in the essentials of manufacture they were equal to those manufactured at Birmingham. The French buttons were chiefly noticeable for the extensive use of coloured enamel in the surfaces, and the elegant effect produced in some of the military buttons of the highest class. How far the button manufacturers of Birmingham might have been benefited by the examination of the French and German specimens exhibited, it would be difficult to say, inasmuch as each one would look at the productions of his foreign competitor from his own particular stand-point. Certainly there were many points of difference, each frequently resulting in some special excellence; nor could these be studied technically without being both suggestive and useful.

Ecclesiastical metal work.

The productions of Birmingham in ecclesiastical metal work were unrepresented; and though the French and Belgian specimens were generally of a high class, especially the larger and more exceptional works in brass, executed for the most part for some particular cathedral in France;

yet these failed to convey the impression, notwithstanding the richness of the ornamentation and elaboration of the handicraft, that they were in any way superior to the best English works of the same class, excepting perhaps in size and complication of construction, which in most cases resolved itself in a simple question of extent. Certainly, in the smaller specimens of candelabra, lecterns, sconces, &c., the general character of the construction of the work and design did not excel the ordinary productions of the same class as manufactured at Birmingham ; and it must ever be borne in mind that it is these latter which constitute ecclesiastical brass work into a special industry, and not *tours de force* like the more remarkable examples exposed by the French. The extent to which coloured enamel is used in assisting the decorative effect of these articles, both large and small, tends to give works of the French a feature quite distinct from those of the English manufacturer, as it also gives an additional value to articles intended for use in connexion with the polychromatic decorations of continental churches. This question of the use of enamel in connexion with metal work is becoming of great importance to the future of many of the ornamental metal trades of Birmingham, and therefore demands more than ordinary attention from those who seek to apply science to industry.

Metal mountings for furniture.

The extent to which ornamental metal work—zinc, bronze, and ormolu—was used in the French furniture in the form, not merely of handles, escutcheons, &c., but in spandril ornaments, rosettes, mouldings, and perforations ; not to speak of bas-reliefs and figures, brought in as special decorations forming essential portions of the construction whilst ornamenting that construction ; might lead to the consideration on the part of our manufacturers as to how far the practice is calculated to encourage the development of a better style of decoration in furniture than at present prevails in England, except in the more costly works. That the judicious application of metal ornaments to particular pieces of furniture, in which ornamentation is used rather to vary and embellish the surface or outline than to be subservient to the use, is worthy of consideration, no one can doubt who carefully studied some of the specimens exhibited by a few of the more noted Parisian manufactuters. Those interested in the ornamental metal trades of Birmingham might usefully study this application of the products of their industry. For without attempting to follow the extreme of elaboration which undoubtly characterised the greater portion of the French specimens of decorated

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furniture, it is certain that many useful hints in the tasteful application of metal decorations to furniture were to be gleaned from the exhibits emanating from the workshops of the cabinetmakers and metal workers of Paris.

Electro-deposit furniture ornaments.

The production of metal decorations for furniture by the electro-deposit process would appear to offer facilities for the application of such ornamental adjuncts in a tasteful and unobtrusive form, and the specimens exhibited by Messrs. Christofle, of Paris, of bronze, gilded and silvered metal mountings, produced by Elkington's process, clearly showed the facility with which these decorations could be produced and applied.

As an illustration of the difference which exists between the demand in France and England for any novelty in ornamentation, it may not be uninteresting to state, that although Messrs. Elkington, Mason, & Co., of Birmingham, tried the experiment of using electro-deposits for decorative details in furniture, yet the almost total want of a demand did not justify them, commercially, in proceeding with the manufacture; whilst in Paris the efforts of Messrs. Christofle have resulted in a constantly increasing trade in this direction. It may therefore be expected that when this method of decorating furniture has been sanctioned by the fiat of a Parisian demand, and comes before the British public with the *prestige* of a French novelty, those who originally applied it in England will be duly patronised in the *imitation* of their own adaptation of their own process.

A dissertation upon the principle which ought to be observed in the application of such a method of ornamentation would be out of place here; but it may be observed that in the best specimens the most satisfactory results arose out of the combination of two differently tinted woods with one metal; and that oxydised silver, bronze in tints varying from a very light to a very dark shade, and ormolu were selected according to the prevailing tone of the woods employed. Wherever this was not carefully attended to, and violent contrasts were introduced, the results were generally unsatisfactory.

Bronzes.

The Parisian productions in figure bronzes, afforded increasing evidence of the extent to which an exceptional industry may be carried, provided talent and energy, together with an intelligent adaptation of the articles produced to the current wants of the day, are brought to bear upon it.

The Birmingham examples of this class were the productions of one house, that of Messrs. Elkington, Mason,

& Co., and certainly these stood the comparison with the French specimens in most points—so far at least as sterling workmanship and general art-accuracy was concerned. In elaboration, high finish, variety of tint, daring in design, and in a certain conventional air, which seems almost inherent in a French bronze, these English works were very far from attaining to a satisfactory position. It is probable, however, that even with these apparent drawbacks, the later had a charm for the continental connoisseur. The sobriety of tone, and a simplicity which at times approached antique severity without any affectation of the classic type, gave a value to some of the best examples which could not fail to be duly appreciated by persons of educated taste.

In some of the more striking of the French bronzes, especially in groups, the variation of tint in the bronze was carried to such an extent as to injure the effect of otherwise fine works. As it is no uncommon thing for English manufacturers to copy the most objectionable features in the more novel productions of their continental competitors, it is probable that this extravagance may find imitators amongst the producers of the better class of works in bronze, since something of the kind has been aimed at from time to time in lamps, gas-brackets, &c.; but a little reflection as to the true value of that unity of tint and finish, which, as already stated, gives a charm to a really good English bronze, will, it is hoped, at once prevent these attempts at meretricious contrast in colour, since the tendency will be to run into extremes.

The commercial bronzes exhibited in the Austrian and Prussian departments were, with few exceptions, hard in character, and did not present those high features in workmanship which characterised the French and English works of the same class. The subjects, too, were frequently strange or common-place.

Works in electro-deposit.

In connexion with the highest class of bronzes, it may be well to consider the relative position of the various works in electro-deposit (*galvano-plastique*). This comparatively new industry appears to have attracted much attention on the continent, and though the best works by this process, so far as regards size, the elaborate character of the treatment, and the difficulties grappled with in production are still produced at Birmingham, yet the advances made since the Great Exhibition of 1851, alike in Germany and France, were amply illustrated in the Palais de l'Industrie. Some of the Prussian works were of a very high

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class, both as regards subject, treatment, and execution; but it is noticeable that, with the exception of France, none of the continental nations appear to have employed the electro-deposit to any great extent commercially. At least there was no evidence in the Universal Exposition that such was the case.

The intimate connexion which exists between the English and French patentees, Messrs. Elkington, Mason, & Co., of Birmingham, and Messrs. Christofle, of Paris, lead, as a matter of course, to results obtained by the two being soon rendered available for the advantage of the other; and thus, in the matter of electro-deposit and electro-plating in gold and silver, the advantages are nearly exclusively English, so far at least as the commercial extension of the application of the process is concerned. Thus the Birmingham houses, patentees, and licencees, apply the process to nearly every article made in imitation of gold and silver, and may be said to almost monopolise the trade which has arisen out of this important discovery.

Brittania metal goods.

The Britannia metal goods manufactured at Birmingham, certainly stood comparison, with few exceptions, both in point of design and execution, with any other exhibits of the same class in the Exhibition. Occasionally the old tendency to over ornamentation existed in all its force, but happily this was the exception, not the rule, since the greater portion of the articles, these being chiefly tea and coffee pots, were characterised by simplicity of form and sobriety of ornamental details both in surface and relief.

Jewellery.

As Birmingham exhibited no jewellery as a speciality, no comparison can be instituted between the usual productions of this class, and the very remarkable display made by the Parisian exhibitors in this department of industry. How much the manufacturers of Birmingham might have benefited by a careful examination of the specimens of French taste, and artistic ability thus brought together, it is impossible to surmise. It is certain, however, that the producers of the commonest specimens of imitation jewellery would have found much to interest, and still more to instruct them. There was much, however, to mislead in design. The very elaborateness of much of the work was a drawback. Natural types were followed to an absurd extent, whilst the more legitimate basis to be found in geometric arrangements of form and colour was almost universally neglected. The revival of steel bead work, and the elegant results produced therein, proved incontestibly that simple means in skillful hands could be made to produce results far more satis-

factory than those wrought out by an erratic use of varied materials.

In imitation jewellery (*bijouterie fausse*), the French did not exhibit largely, except in the larger works of this class, which may be termed theatrical jewellery. The remarkable skill shown in some of the specimens exposed, proved that not only a very considerable amount of taste in arrangement and skill in adaptation were brought to bear upon this speciality, but that the handicraft power employed therein was frequently as great, and the results as successful as when employed upon the precious metals, and the setting of true stones. Many exhibits of ecclesiastical costume decorations may be placed in the same category, and Birmingham manufacturers might have learnt the important lesson that vulgarity is not an inherent constituant of imitation jewellery.

Filagree work.

In filagree work, the French examples were at once numerous, and of a highly artistic character. The judicious introduction of stones and pearls into some of the more highly wrought specimens of gold filagree resulted in charming effects of contrast in material and colour. Filagree working in Birmingham is now very exceptional, there being not more than one or two establishments in which it is pursued, and in these it is directed more to the production of bouquets of an ultra naturalesque character than to the more legitimate ornaments to which its peculiarities would indicate it as being best adapted, and which commercially it might reasonably be expected that there would be the greatest demand. The great skill of the modern French filagree workers and the adaptability of the process to the production of objects of great beauty and elegance were proved beyond a doubt, in the great variety of forms in which filagree was shown in the Universal Exhibition.

Niello work.

The revival by the French of niello work as applied to the decoration of snuff boxes, cigar cases, &c., is a point worthy of attention by English manufacturers, and it is also worthy of consideration, how far the electro-deposit process may be brought to bear upon an economic reproduction of a number of the same designs.

Dress fastenings.

In the illustration of the manufacture of dress-fastenings of a plain but useful character, such as buckles, hooks and eyes, pins, &c., the Birmingham contributions were singularly deficient. This was the more to be regretted, inasmuch as from the specimens shown the inference was inevitable that in this important branch of industry Birmingham would have stood pre-eminent, had a proper display been made; yet, notwithstanding the fact that many tons weight

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of metal are consumed weekly in the production of an immense variety of articles, all of an indispensable character to the tailor, dressmaker, and milliner, and in constant demand in a variety of forms all over the world, it would have been difficult to have realized from the comparatively few exhibits, that the production of these articles formed more than a small staple of the manufactures of Birmingham. The ingenuity in construction and adaptability to a given purpose which characterize English productions of this class, not to mention extreme lowness of price, could not have failed to command attention, had a systematic display been made; and thus that which at first sight may appear an insignificant department of British industry would have taken its true position, since none of the continental nations, Prussia excepted, gave evidence of any special power in the manufacture of that infinite variety of useful articles, coming under the generic head of dress-fastenings.

Steel pens, fish hooks, and needles.

In the smaller kind of steel articles, such as steel pens, fish hooks, and needles, the examples exhibited from Birmingham, stood comparison with similar productions from other localities, British and continental, and in some respects surpassed them. The illustration of the present position of the steel pen manufacture was, however, very incomplete, as several leading Birmingham makers, and those too of the highest repute, did not exhibit.

Works in zinc.

The extent to which ornamental zinc work is manufactured upon the continent has no parallel in England. In this respect Birmingham may be said to have a new field before it, and it is more than probable that attention to this growing industry in its more readily applied forms, such as repetitions of ornamental details for architectural decorations, would have a useful effect upon other and kindred branches of manufacture.

Garden decorations.

The application of zinc in the production of garden decorations is a point deserving special mention, and one Prussian exhibit by De Diebetsch, of Berlin, illustrated in an admirable manner the adaptability of this metal for producing at once tasteful and useful results. The example in question consisted of a series of *jardinières*, so to speak, of complicated construction and highly decorative detail in the Moresque style of ornament. Some of the specimens were gilt, and painted in polychrome, other portions being treated with acids: a variety of tint in the metal itself being obtained thereby. Even as suggestive of a method of producing ornamental flower pots in zinc, this contribution was worthy of special examination and attention.

Flower-pots in zinc.

Articles in galvanized zinc, as a cheap substitute for bronze, appear to be largely manufactured in Paris. This process of depositing a coating of copper upon the surface of the zinc is also frequently applied to large and important works. Little or nothing has been done in this direction in England, at least for commercial purposes, nor is it desirable that so questionable a mode of production should be encouraged.

Galvanized zinc.

Ornamental castings in iron can scarcely be said to have been represented amongst the special Birmingham contributions; but as the Coalbrookdale Company appeared as the Midland Counties representative of this valuable and increasing branch of British industry, the specimens exhibited by this house may be taken as illustrations of the highest class of productions in cast-iron, especially as devoted to the purposes of the park and garden. The articles exhibited by the Coalbrookdale Company were of a very varied character alike as regards purpose, and style of decoration; but excellent as they were in many respects they certainly lacked the refinement in ornamental detail so fully manifested in the stoves exhibited in the French department of the Annexe of the Palais de l'Industrie, by Laury, of Paris. Still for the special purpose which most of the Coalbrookdale articles were intended to fulfil, there is no reason to suppose that they were in any material respect inferior to continental productions of a similar class; on the contrary, so far as workmanship in construction, and their thoroughly practical adaptation to the use for which they were intended, was concerned, they were superior to the majority. The ornamentation was at times a little too exuberant, in fact, too much in the French taste, and was not always appropriately arranged so as to become subservient to the uses of the article decorated. In this respect, however, as much might be said of many Austrian, Prussian, and Belgian productions. It is worthy of notice that the generality of French ornamental iron castings are as remarkable for severity of style and freedom from over-elaboration, as French castings in bronze, &c., are for excess of detail and obtrusive decorative adjuncts. The iron used for the best French castings is evidently charcoal-made iron, the surface being very clear and smooth, and very similar to the best American castings of the same class; the various parts of the work being given with great sharpness and accuracy, and thus requiring very little "dressing."

Ornamental iron castings.

In the more useful cast-iron articles, such as kitchen utensils, especially enamelled hollow-ware, the exhibits of

Kitchen utensils in iron

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Austria and Prussia presented features which evidenced a great improvement during the last three or four years; but it is quite clear that English exhibitors of these useful articles have been fully alive to the importance of improvement, and two leading representatives of this branch of industry, Messrs. Clark, of Wolverhampton, and Messrs. Kenrick, of Westbromwich, certainly more than sustained their position, not only by the character of the work, but the variety of the utensils to which they had succeeded in applying the process.

Glass enamel on sheet-iron.

The Birmingham productions of the Patent Enamel Company under Paris's patent, were not represented in the Exposition. These consist of a great variety of utensils stamped in sheet-iron for culinary and other purposes, the surfaces of which *inside* and *outside* are covered with a glass enamel. Though originally a French invention, it is now likely to form an important feature in British manufactures, since it can be applied to many articles made in wrought iron, which require to be protected from the atmosphere or the action of water. Plates, dishes, &c. produced by this process for table use are susceptible of any amount of decoration in the manner and by the methods applicable to ordinary earthenware or porcelain, and are peculiarly suitable for ship purposes from their lightnesss and non-liability to fracture. In many decorative purposes this method of enamelling on sheet iron is likely, under proper direction, to become of great value and importance.

Tinned ware.

The manufacture of ordinary tinned ware, both japanned and in the metallic form, was very fully and ably represented, and certainly stood unrivalled by anything exhibited by the French or any other continental people. The utility of the articles exhibited, their price, and the very unexceptionable manner in which most of the articles were decorated, must have conveyed to the continental visitor a very favourable idea of the practical character of this industry. Excellence of material, perfection of workmanship as regards form, adaptation to use, and finish in the non-ornamental articles, were a few of the points which undoubtedly rendered the British display as complete and effective as other portions were remarkable for the opposite result. Two of the exhibitors were Wolverhampton houses, three only being Birmingham firms. The five, however, illustrated the tin and japan ware trades of the Midland counties in so satisfactory a manner as to leave little to desire, especially when considered in comparison with the productions of France, Belgium, and Austria.

The Birmingham contributions in papier mâché were of the average character, alike in design and execution. There was, however, some evidence of improvement in the selection of the subjects used in the decorations, as also in a tendency to try geometric arrangements; but rather as a vehicle for colour and gilding than as the absolute basis of the details employed. The examples exhibited in the French and German departments bore marked evidence of improvement in some of the best articles, but with all their artistic errors the Birmingham productions were certainly very superior, in point of workmanship and finish, to any other works of the same class. Papier mâché.

With the exception of a colossal candelabrum manufactured by Messrs. Osler, the Birmingham glass trade may be said to be almost unrepresented so far as any special points of interest were concerned. Messrs. Lloyd and Summerfield illustrated their new method of applying glass to the construction and decoration of window frames, &c., and contributed a few specimens of table glass; but beyond this and a small contribution from another house, no means were afforded for a just comparison of the position of the domestic and ornamental glass trade of England with that of the Continent. It is tolerably certain, however, that our leading manufacturers had little or nothing to lose by the comparison, had they afforded materials for instituting it by contributing, and probably they also felt that they had little to gain. Hence the apathy manifested. Glass.

The candelabrum above alluded to, certainly stood unapproached, alike in the design or adaptation of the forms to the materials, as also in the execution of the work. A thoroughly crystal type was followed throughout, and a varied effect produced by the arrangement of the whole as a series of prisms, and cutting of facets. In this respect it formed a marked contrast to similar productions exhibited in the French department, in which architectural effects were attempted to be produced by the aid of scroll-work, acanthus foliage, consoles, bosses, &c. As the ornamental details of the various parts of a candelabrum constructed of glass transmit the light through the forms in precisely the same manner as the constructive parts, it must be evident that the use of decorative forms or details, in which the effects depend upon the light and shade as seen in an opaque material, is a mistake which can only result in diappointment. The sound principle upon which the Birmingham candelabrum was constructed and decorated served to prove

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this in a remarkable manner; and there is no doubt the lesson will have its value, both at home and abroad.

Decorated window glass.

The method, introduced by Messrs. Chance, of decorating window glass by the transmission of impressions from lithographic stones, either drawn in chalk or ink, was illustrated by a few contributions; but unfortunately the subjects and style of execution were not of such a character as to attract much attention. This was to be regretted, as, with a judicious adaptation of a means at once simple and effective where a proper mode of treatment is adopted, highly decorative effects may be obtained in an economic manner.

Stained glass.

The stained glass windows of Messrs. Hardman, executed for Westminster Hall and the House of Lords, stood the comparison with the best works of the class in the Exposition, and in point of truth of principle in design were nearly alone in this special style.

Inter-crystal ornamentation.

In connexion with the decoration of glass, although classified with and exhibited amongst works in gold and silver, it may be desirable to name a novel method of introducing decorations in gold and silver between two surfaces of glass. The effect was very satisfactory, the process being termed *inter-crystal* by the inventor, M. Grichois, of Paris, by whom the process is patented. No details, however, were given as to its economical use; but from the specimens exhibited it is applicable to a great variety of articles, and equally so to curved as to plane surfaces.

Fire-arms.

In fire-arms the contributions from Birmingham were very few, and this was the more striking from the extent to which France, Belgium, and Prussia illustrated their respective products in this wide-spread industry. On examining the military fire-arms produced at Liege of about the same standard as the arms most extensively manufactured at Birmingham, forming in fact, its great staple in this trade, there can be little doubt that had the Birmingham gun trade organized a thorough display of its usual productions, commencing with the cheaper kind of arms, and gradually illustrating each department until the higher class was reached, such a display would have done honour, not only to Birmingham, but to the country, and have been pre-eminently useful to the parties most interested, the manufacturers themselves. As it was, the gun trade of England, taken as a whole, was practically ignored, and therefore no useful comparison can be instituted between its productions and those so judiciously exhibited and so admirably arranged by the Belgian and

Prussian manufacturers. It may be remarked that the artistic talent brought to bear upon the decoration of the higher class of arms, especially those exhibited by Prussia was of a high character; not always judiciously applied, but still giving evidence of refinement in the producers of these arms, which is somewhat rare amongst ourselves, since the engraving of gun-locks and furniture is mostly very pretentious in execution and vulgar in design.

In harness and coach furniture, saddlers' ironmongery, and lamps for carriages and railway purposes, the Birmingham and Midland Counties exhibits were certainly both useful and effective. These extensive industries giving employment to whole populations, as in the case of Walsall, and assuming as they do such a variety of forms, each adapted to the demands of some distinct quarter of the globe, were not so completely illustrated as could have been wished, considering the extent of the interests involved therein. But it must be borne in mind that a thorough exposition of the whole of the peculiarities of a trade assuming so many phases, would have involved the systematic collection of the products of a considerable district, in which from the sub-division of labour, very few individuals could be expected to take a sufficient interest to incur the necessary labour and expense. The general character of these productions was, however very fairly shown; and certainly the excellence of some portions of the harness and saddlers' ironmongery were unrivalled, so far as workmanship and finish was concerned. Contrasted with the French productions of the same class, it was less ornamental, and occasionally looked heavy from abundance of metal. Nor were the attempts at ornamental arrangement always so successful as they might have been, there being few departments of industry more susceptible of improvement than the metal mountings of harness and carriages; since in the majority of cases the ornamental work is either absolutely thrown away, from not being so adapted to the forms demanded by the use as to at once become part of those forms and yet decorate them, or, on the other hand, the decoration is so clumsily adapted as to become an excresence. Nor did the English productions in the Universal Exposition stand alone in this respect, since something of the same kind characterized those of France and other continental countries.

Harness, coach furniture, &c.

In the speciality of railway and carriage lamps, the Birmingham contributions were confined to one or two

Railway and carriage lamps.

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exhibitors. Those adapted to railways were of a character far superior to similar articles exhibited in other places in the Palais de l'Industrie ; but it is to be regretted that in so important a branch of trade as that of ordinary carriage lamps a more satisfactory display was not made.

Table lamps.

Whilst upon the subject of lamps, it may be as well to remark that the greater portion of table and bracket lamps exhibited from Birmingham were little more than re-productions, though not, perhaps, absolute copies of the ordinary French moderator lamps. They frequently showed good workmanship, and occasionally a happy and tasteful combination of materials, and were calculated, as a whole, to sustain the industrial, if not the artistic, position of Birmingham in this particular department of trade.

Locks.

In locks, the exhibitors were few, but the specimens contributed were of a good character, and there is no reason to suppose that the relative position of the British and continental producers of these articles is in any way changed to the detriment of the former. Certainly in the three great points of ingenuity of construction, excellence of workmanship, and lowness of price, English locks keep their position. In the question of form and decoration, opinions may be in favour of some of the continental productions ; but these were not always so judiciously ornamented as they might have been.

Builder's ironmongery.

Probably the point in which the hardware industry of the Midland Counties of England may be said to have been most defective in representation, was in the extensive and numerous branches of industry, coming under the general head of builders' ironmongery, such as common locks, latches, bolts, hinges, screws, nails, &c., and it is to be regretted that some organized plan was not adopted by the local committees of Birmingham, Wolverhampton, and Walsall, for the thorough and complete illustration of this highly important and useful branch of British trade and commerce. If this had been done, and prices attached to the various samples when exhibited, the result could not have failed of being highly beneficial, alike to the home manufacturer and merchant, as to the foreign buyer and consumer ; and it is feared that an opportunity has been lost for extending a knowledge of British powers of production in a most valuable and profitable range of articles always in demand, which it is not likely will occur again for some years at least.

Conclusion.

In conclusion, it may be as well to state as a brief sum-

mary, that in nearly the whole of those departments of industry in which the manufacturers of Birmingham really took the trouble to show what they were doing, British industry stood well, and that the deficiency did not lie so much in the standard of excellence as in the poverty of representation, and the often careless and tasteless manner in which the exhibits were displayed.

I have the honour to be, &c.

George Wallis.

ON CLASS XXI., SILK MANUFACTURES.—By THOMAS WINKWORTH, Juror for that Class. MR. WINKWORTH ON SILK MANUFACTURES.

MY LORD,

HAVING been requested to report upon "the position which the United Kingdom held in the late Paris Exhibition compared with foreign countries, and upon the progress, if any, which has been made since 1851," in respect of the class of objects on which I acted as Juror, viz., silk manufactures, or Class XXI. I beg to submit to your Lordship the following observations :—

Basis of Report.

It would not be difficult to render in a few words such a reply to these questions as, under ordinary circumstances, might be deemed sufficient for a comparison, of the proportion which the awards given to Exhibitors in 1855 bear to their number in each country with that of 1851, would seem to be the measure of relative position and progress. An obvious reason, however, exists why no such answer could be taken as other than a proximate opinion of the different Juries on those two occasions. The basis on which they were instructed to decide in 1851, was to be a comparison with each other of the articles exhibited by each country taken separately, while in 1855 they were desired to view and award upon the collection as a whole, without reference to the particular or separate countries from which it was supplied. I must, therefore, claim for myself rather more latitude than, under other circumstances, I might have required, and endeavour to evolve out of a mass of individual opinion with which I have been favoured by co-jurors and others, and of statistical detail more or less official, such facts as may enable me to report satisfactorily to myself on the foregoing questions.

Silk manufacture of the United Kingdom.

I propose, in the first instance, to present an epitome of the silk manufacture of the UNITED KINGDOM, and then to notice, as far as may be necessary, the position which other exhibiting countries appear at this moment to occupy.

There is probably no manufacture in this country, the historical incidents of which are so anomalous as that of silk. It appears to have had a recognised existence so early as the 14th century, and in 1454 an Act was passed for the pro-

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tection of women against the importation of foreign silk articles, such as "twined ribbons, chains, or girdles." This Act was from time to time renewed, with additional lists of articles to be prohibited. In 1585, the manufacture received an impulse, by the arrival of a number of merchants and artisans from Antwerp, where the trade had been long carried on. Other foreign manufacturers occasionally settled in England, and in the reign of Elizabeth, the number of persons engaged in the production of silk goods, was estimated at 40,000.

Parliamentary regulations.

From this time the manufacture appears to have been subjected to a series of parliamentary regulations, generally at the instance of the masters or their workmen, or of both, the most extraordinary and, as we should now deem them, the most vexatious that could well have been devised. At one time all foreign manufactured silks were absolutely prohibited; then allowed to come in free of duty; and occasionally certain descriptions only were prohibited, as in 1692, when the refugees who settled here after the revocation of the Edict of Nantes in 1685, actually obtaind a patent, and ultimately an Act of Parliament, confining the manufacture of "lustrings and à la modes," to themselves, and prohibiting their importation. These alternations of prohibition, partial prohibition, and free importation, of which I have dates and details before me, derived principally from Mr. M'Culloch's "Dictionary of Commerce," and from a paper read before the Chamber of Commerce of Manchester, by Mr. John Chadwick, of that city, had that influence on the manufacture which might naturally be expected. Under absolute prohibition or partial restriction it languished; under free importation, as in or about 1685 to 1692, though the average annual imports amounted to nearly 700,000*l.*, it flourished. In 1697, the advocates of prohibition would appear to have reached their culminating point, for in that year the ports were closed to all foreign manufactured silks, and, except during a sort of lucid interval of temporary relaxation, remained so until 1826.

Progress of the trade under protection.

The quantities of raw and thrown silk taken into consumption at certain intervals during this long period of prohibition, afford evidence of the slow progress of the trade under protection. The average for the years 1765, 1766, and 1767, was 715,000 lbs; for 1785, 1786, and 1787, was 891,000 lbs.; for 1801 to 1812, 1,110,000 lbs.; for 1815, 1816, and 1817, 1,388,000 lbs.; and for 1821, 1822, and 1823, 2,325,000 lbs.

Under such influences, the vicissitudes of the trade were, of course, distressing. The king and the legislature were implored to devise, or to adopt at the suggestion of the sufferers, measures of relief, and large sums for the benefit of the starving operatives were occasionally subscribed. Balls, attended by the Royal Family, and at which only new silks of British manufacture were to be worn, were given, and riots in Spitalfields were not of unfrequent occurrence. Smuggling, disputes between masters and men as to wages, parliamentary interferences, destruction of silks in the loom, and even in wear, when supposed to be of foreign manufacture, were the rule—occasional quiet and profitable employment the exception.

Admission of foreign silks.

At length a brighter star dawned upon the trade, correct principles began to take root in the manufacturing mind, and as if wearied with these fearful consequences of an erroneous and fitful policy, Parliament interfered, and in the memorable year 1826, but not without a long struggle with the majority of the manufacturers, foreign silk goods were permitted to come in at an import duty of 30 per cent. ad valorem. This heavy impost would seem to have been a measure of temporary expediency, for though it was reluctantly accepted as a kind of compromise. the effect was, as the advocates of free importation prophesied, to some extent more injurious than the state of things which obtained under total prohibition. In the latter condition, foreign silks, from certain peculiarities of length, width, and texture, were immediately recognised, and when detected, seized; while in the former case, being admitted on payment of duty, it was difficult to prove that smuggled goods had not passed through the Custom House in the regular way. The estimated result, according to Mr. Macgregor, was, that from 1827 to 1843, out of 6,332,132 lbs. of manufactured silks imported from France, only 3,170,112 lbs., or about one half of the quantity, paid duty.

Reduction of the duty.

This was a state of things so mischievous, both morally and economically, that in the year 1845, the nominal duty of 30 per cent. was reduced one-half, viz., to 15 per cent. ad valorem, or to five shillings per lb., at the option of the Commissioners of Customs. As the charge of the smuggler was from 12½ to 15 per cent., this branch of his illicit trade was nearly annihilated.

It is not necessary that I should present a similar history of the raw and thrown, or partially manufactured, silk trade; it is sufficient for the purposes of this report to observe that, except as to absolute prohibition, the policy pursued was

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almost equally suicidal with that by which the manufacturing branch was "protected," but injured. At one time heavy, at another lower duties were imposed, especially on the thrown material.

Importation of raw and thrown silk.

Of course, when in 1826, foreign manufactured silks were permitted to be imported at the duty of 30 per cent. ad valorem, the impulse given to that interest in England extended itself in corresponding proportions to the raw and thrown article. Accordingly we find, that whereas the largest previous importation was in 1823, when 2,400,000 lbs. were taken into consumption, in 1828, it amounted to nearly 4,300,000, But this prosperity was not of long duration, for while in the five years ending 1823, the average importations were 2,145,425 lbs.; the average for the five years ending 1828 was only 3,660,083 lbs.; and in the following five years, only 3,695,918 lbs.

Repeal of the duty on raw and thrown silk.

When, however, in 1845, the duty on foreign manufactured silks was reduced as above, that on raw and thrown silks was totally repealed, and with the most beneficial results, for the throwsters who had hitherto been unable to find foreign markets for their products to any appreciable extent, began then to export in reality. In 1848, they exported 45,693 lbs., and in 1854, no less than 205,186 lbs., thus affording almost irrefragable evidence that a similar policy in manufactured silks would be followed by corresponding advantages.

Result of the removal of the duties.

It may be inferred from the foregoing hasty review, that the silk manufacture of this country forms no exception to the rule that important advantages may always be expected to result from the removal of prohibitory and protective duties. At the same time, its subsequent prosperity has not been altogether of that marked and progressive character which might have been anticipated. It is difficult to assign with certainty the causes of this, but probably one of them may be, that the acknowledged genius of this country lies in the production of goods suitable in quality and price for the million; and this presumption on the part of the dealers and consumers much confines the demand for British manufactures to the lower and cheaper grades. And nearly allied to this is that prevalent commercial spirit which, eager for the speedy acquisition of wealth, undervalues all other excellences but such low prices as lead to easy, extensive, and rapid sale. It is obvious that such influences must be depressing and deteriorative to a manufacturer, whose raw material is very costly, and whose ultimate and permanent prosperity must be based on intrinsic excellence.

Nor ought it to be forgotten that fashion, whose dominion is as wide as it is capricious, and for the infraction of whose laws no merit can atone, holds her court in a neighbouring country. All, therefore, who are so dependent on her smiles as the dealers in silk goods, must seek the earliest intimations of her will, not in London but in Paris.

It has, also, often been supposed that a higher taste in the British manufacturer, would add to his success. Doubtless, a high and pure taste is of advantage, but if the want of that alone interfered with his prosperity, he would not be slow to purchase the services of those who possessed it, whether natives or foreigners.

Import duty on foreign silks.

The existence still of an import duty on foreign manufactured silks has likewise, in the opinion of some, operated unfavourably to the British manufacturer, especially in foreign markets. The greater portion of the silk manufacturers of Manchester, acting upon this conviction, signed in 1852 a memorial to the then Chancellor of the Exchequer, praying for the total repeal of the impost in question. The memorial itself being subjoined to this report renders any further statements on this subject unnecessary. (See Appendix A.)

Increase in the export of British silks.

It is, however, after all, consolatory to find that notwithstanding any prejudice which may arise from the above or any other causes, and also the heavy duties imposed in most foreign countries, not even excepting France, and some of which I shall take occasion presently to specify, the export of British silk manufactures is to some extent increasing. Thus, according to the "Annual Statement of Trade and Navigation, &c. for 1854," recently issued, it appears that in declared value they amounted—

in 1850 to	£1,202,368,
in 1851 to	1,268,975,
in 1852 to	1,357,342,
in 1853 to	1,805,065,
and in 1854 to	1,507,160.

On the other hand our imports of foreign manufactured silks were, on the same authority,—

in 1850	£2,430,369,
in 1851	1,676,384,
in 1852	1,728,695,
in 1853	2,228,083,
and in 1854	2,310,171.

As far as the returns for 1855 have transpired, they fully confirm this favourable statement of progressive in-

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crease of external demand, and which I have reason to know is especially the case as regards the United States. This may, I think, be pretty confidently ascribed in part to the opportunity which the recent Paris Exhibition afforded to purchasers from that country of comparing, under all the disadvantages of imperfect classification which has hitherto prevailed at these international collections, the silk goods of England with those of France and other countries.

Suggestion with regard to arrangement.

It may be beside the strict province of this report to venture a suggestion for the future arrangement of international exhibitions, but it would vastly assist jurors, purchasers, and visitors generally, and be in harmony with their ostensible object, an arena for free competition, if all articles of a class were exposed in one locality. In the class under review, both in 1851 and in 1855, silks and silk manufactures were distributed throughout all parts of the buildings, and no opportunity, therefore, was afforded for comparison of country with country, with the additional risk in obscure districts, of no examination at all. I also think, that even as regards the cases or frames in which goods requiring them are exposed, it would still more conduce to convenience and certainly to uniformity of artistic effect, if all of a class were made on one model. This, however, I must be content to offer as an additional suggestion, by no means necessary to the adoption of the former.

Silk manufacture of France.

The silk manufacture of FRANCE is that of which the nation is perhaps most proud, and to which it justly attaches great importance. Like that of England, it has been subject to great vicissitudes, the results rather of political convulsions than of governmental interferences. It may in brief be stated with respect to its historical progress, that it owes its introduction from Sicily, Italy generally, and Spain, during the 14th and 15th centuries, to the civil and religious wars which then prevailed. The number of workpeople at Lyons engaged in this manufacture, between 1650 and 1680, or about 200 years after its establishment in France, was estimated at between 9,000 and 12,000. After the revocation of the Edict of Nantes in 1685, the numbers fell to about 3,000 to 5,900, and so remained until 1750 or thereabouts, from which date to 1790 they gradually increased to 18,000. From 1792 to 1800, in consequence of the revolutionary period and the wars resulting therefrom, the number of artisans was again reduced to between 3,000 and 4,000. By slow

degrees and following the march of returning order and security, they rose to 12,000, and so remained, with slight fluctuations, until the peace of 1814. In 1816 there were said to be as many as 20,000; in 1827, 27,000; in 1837, 40,000; in 1848, 50,000; and at this time there are probably not less than from 60,000 to 80,000. But this statement only applies to the progress and present condition of Lyons and its environs. There are other important towns and districts in which the silk manufacture is carried on, the statistics of which, if collected, would no doubt exhibit similar results. The most important of these is St. Etienne, the seat of the ribbon manufacture, and in which at this time, there are from 30,000 to 40,000 persons engaged. Considerable manufactures of silk and silk mixed fabrics are also established at Paris, Nîmes, Avignon, St. Chaumont, and in various parts of Picardy, Normandy, and Alsace. Altogether in the production of silk, and of mixed goods, silk being predominant, the number of artisans can scarcely be taken at less than from 150,000 to 180,000. It must be understood that in this and similar estimates I only include those employed in weaving, as I am not in possession of the requisite information as to the numbers engaged in the preliminary processes of reeling, throwing, dyeing, &c., or the subsequent ones, according to the nature of the article, of dressing, watering, or printing.

Silk manufacture of France.

In estimating the value and importance of the silk manufacture to France, it ought not to be forgotten that a considerable portion of the raw material is advantageously produced in the same, or in districts immediately contiguous to those in which its conversion into goods is mostly effected. I have no means of ascertaining the quantities of raw material thus produced, nor can I obtain any reliable information as to the quantity imported. I am consequently unable to state the total amount of silk consumed in the manufactures of France.

Its importance.

If, however, with the foregoing statement of the number of artisans employed be connected the estimated value of the articles produced by them, we may form a tolerably correct idea of the importance of the French silk manufacture, as compared with that of our own country. This value in each of the years 1851, 1852, and 1853, is said to have amounted to not less than 15,000,000*l.*

The export from France of goods wholly or partly of silk, was estimated by M. Arlès Dufour, the Secretary of the Imperial Commission of 1855, and President of the class under review, in 1851 at from 7,600,000*l.* to

Export from France.

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8,800,000*l.* According to the same authority it has since fallen to about 7,500,000*l.* Whether this retrograde movement arises from permanent or temporary causes, is not easily ascertainable, but it is worthy of remark that during the same period, the export of similar manufactures of this country, advanced from 1,268,975*l.* in 1851, to 1,507,160*l.* in 1854.

Advantages which would result from the removal of the duties.

Anomalous events must, however, always be expected where manufactures are at all in an exceptional position, and it is scarcely susceptible of a doubt, that if the artificial state occasioned by the duties on the importation of manufactured silks now imposed in France and other countries were removed, it would prove mutually advantageous. A greater security would thus be given to the manufacturer, and an injurious antagonism be removed. Added to this, the public of each country would be supplied at the lowest cost with what the silk manufacturers of each could easiest and best produce. I have great pleasure in again quoting from M. Arlès Dufour on this point, who, while not pretending to any knowledge of the precise effects which the abolition in France of the nominal import duty of 10 to 12 per cent. ad valorem, but practically of 33 per cent., and the introduction of free trade in this manufacture, might eventuate, is of opinion that "it would be profitable to both countries. England would cease to copy our rich fancy silks, and would devote its whole energy to the production of the low and middle qualities, while France on the contrary would apply itself with increased attention to the production of the former." He might have added, that under the united efforts of the manufacturers of both countries in the cultivation of their separate "specialités," such an impetus might be given to the silk trade, as no other combination of circumstances could render possible.

Silk manufactures of Austria.

The manufacture of broad silk and ribbons in Austria is principally confined to the district of Vienna, but the production and cultivation of the raw material, extends over a large portion of its dominions in Italy.

"While prohibition of foreign silks continued," writes a manufacturing correspondent at Vienna, "we were compelled to confine the products of our looms to such articles as the caprices of luxury and fashion exacted of us, and having no foreign vent, our strength was dissipated on variety and perfection attained in nothing. During the last two years, however, that our frontiers have been opened, an improved taste has supervened, and manufacturers now

address themselves to the careful production of such goods as best suit their abilities and taste, and with the most gratifying results, as the table I herewith send you, will amply prove." (This table supplied by my co-juror, M. Hornbostel, and including also raw, thrown, and dyed silks, may be found in Appendix B.) It will there be seen that while under prohibition in 1851, the import of silk and silk mixed goods amounted only to 286 lbs., and the exports to 176,384 lbs., in 1853 the imports had increased to 46,190 lbs., and the exports to 863,000 lbs.; thus affording evidence still more remarkable than that supplied by any other country, of the beneficial effect of a liberal commercial policy. At this moment the import duty is only about 5*s.* 3*d.* per lb., or a fraction more than our own.

Number of looms.

The number of looms generally at work in all branches of the silk manufacture gives employment to not less than 30,000 persons.

Exports.

The exports of silk goods are principally to other parts of Germany and Italy; to the east, especially the Danubian Principalities; and to the United States, *viâ* Hamburg.

I believe I only echo the opinions of my colleagues when I say that we were all sensible of the advances which the silk manufacturers of Vienna had made since 1851 in taste and execution. There is still, however, the same disposition to cultivate the production of those more showy and weighty fabrics for furniture of houses and carriages, and for ecclesiastical uses, which give scope for the introduction of inferior materials at the expense of intrinsic value.

Silk manufacture of Prussia.

So far as quantity is concerned, the silk manufacture of PRUSSIA may be considered as occupying a respectable position, and even in quality, a large proportion of the goods recently exhibited supply evidence of care in the selection of the raw material and skill in workmanship, especially since 1851. To taste, it makes little or no pretension, and very few fancy silks were to be seen in this department. The Rhenish provinces constitute the principal seat of this branch of industry which gives employment to between 50,000 and 60,000 persons.

The quantity of raw, thrown, and dyed silk imported in 1850 was 1,669,736 lbs., and in 1853, 2,181,186 lbs. Of silk and silk mixed manufactures in 1850, 573,079 lbs.; and in 1853, 608,359 lbs. The exports of silk manufactures pure and mixed show an increase of nearly 100 per cent., as in 1850 they only amounted to 1,312,306 lbs., but in 1853 to 2,445,345 lbs.; and, as far as the returns for 1854 are

Mr. Winkworth on Silk Manufactures.

completed, they afford proof of continued, if not rapid, progress.

The principal external markets are France, England, the United States, and other parts of Germany; but it is probable that as the Prussian silk manufacturers produce large quantities of low-priced and useful articles, many of the extra exports of 1853 may have found their way to Australia and other gold-producing countries.

Import duty.

The import duty on silk and on silk mixed manufactures is rather under 4*s.* per lb. on the former, and 2*s.* per lb. on the latter

I am indebted to one of my co-jurors, M. Diergardt, an eminent silk manufacturer of Viersen, in Rhenish Prussia, and a member of the Chamber of Deputies of that country, for a carefully prepared table of exports and imports for the last four years, from which I have drawn the foregoing statistical details. (*See* Appendix C.)

Silk manufacture of Switzerland.

The manufacture of silks in SWITZERLAND has arrived at a relative importance altogether remarkable, for though it was introduced into that country so early as the 13th and 14th centuries, it is not until within a comparatively recent period that it has reached its present prosperous position. Zurich is the seat of the broad or garment silk manufacture, and Basle of the narrow or ribbon branch. The number of artisans employed in the two districts together is not less than 40,000, and is more probably 50,000. They have their schools of design, and avail themselves freely of all those other modern appliances, mechanical and artistic, which are so important to the profitable prosecution of this manufacture. Hitherto, however, their progress in the higher branches of the trade has not been sensibly developed, but in the lower and middle qualities of goods it has attained a degree of perfection highly creditable to their ingenuity and perseverance and formidable to foreign competitors. This is especially the case as to France, where, notwithstanding the heavy import duty there exacted, the ribbons of Basle rival those of St. Etienne even in the fancy branches, and obtain an extensive sale.

Number of looms.

There are about 8,000 or 9,000 looms generally at work at Basle producing ribbons of the annual value of 1,500,000*l.* I am not in possession of the statistics of Zurich in these particulars; but though the proportion of workpeople employed may be similar, the results must be different, as many of the weavers in the latter district are partly occupied in agriculture, and do not therefore produce the same

quantity of goods in the same space of time. This peculiarity has also the effect of lowering the standard of wages, and thus enables the manufacturer to offer his goods with more confidence as regards price in competition with those of other countries. Mr. Winkworth on Silk Manufactures.

The import duty on thrown silk is about 3*s.* 6*d.* per lb., and 15 per cent. ad valorem on manufactured silks. Import duty.

I have reason to know that many of the manufacturers would willingly consent to the abrogation of these duties, and that they concur with those of Manchester in opinion that it would be the harbinger of still greater success than that which they even now enjoy. "If there were no duties," writes my colleague, M. Battier, from Switzerland, "if, in short, we had the benefit of free trade, my country would be in the best possible condition of prosperity."

The goods recently exhibited afforded encouraging evidence of improvement since 1851, and though the greater part were of a class consuming but a small weight of silk, they were, with few exceptions, extremely well made. One of the manufacturers obtained the gold medal. Improvement.

Of other European countries which exhibited silk manufactures little need be said. Whether from political circumstances, high tariffs, or total prohibition, the displays of Spain, Portugal, Greece, Tuscany (Florence), Belgium, Bavaria, and Baden were inconsiderable in quantity, and failed to obtain a noticeable position. It must, however, be admitted that both in design and quality there was manifest improvement since 1851. Other countries.

With respect to our only silk-producing colony, the East Indies, as I have reason to believe that Dr. Royle, under whose direction the magnificent oriental collection at Paris was arranged, will specially report on its products, both raw and manufactured, I will only mention that the attention of the jury was attracted to the double weaving from Poonah, some very curious specimens of weaving from Rangoon, and some brocades from Benares and Ahmedabad. Silk from the East Indies.

Having thus brought under review the present condition of the silk manufactures of Europe and alluded to those of Asia, I come now to the question whether, as compared with any or all of them, and taking the special circumstances of each country into account, those of the United Kingdom occupy a respectable position and contain evidence of progress since 1851. Position occupied by the United Kingdom.

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Before, however, proceeding further, it seems necessary to invite attention to the wide field the silk manufacture covers, entering as it does into the composition of such a vast variety of fabrics, and forming as much the substance of a skein of sewing silk and a penny ribbon, as of the hangings of a palace or the richest court dress. It is evident therefore that the total quantities of raw and thrown silk imported and consumed in different countries to which I have so often alluded, is dependent on the silk manufacture considered as a whole. At the same time that branch of the manufactured or matured article, popularly understood as the silk manufacture, comprises more especially articles for furniture and dress, and it is to these that my attention has been more particularly addressed.

No furniture silk exhibited.

There was no English silk furniture in the late Exhibition. In that of London in 1851 some specimens were exhibited, made both in London and Manchester, which obtained respectable notice. I have no reason to believe that this branch has at all retrograded, though the Exhibition itself afforded no evidence on the subject. I must therefore restrict my further observations to the manufactured article as supplying the materials of dress, and in which, as throughout this report, I include both ribbons and broad silks.

Materials for dress.

The qualities which constitute its value and the criterion by which it is estimated in this respect, may be stated as fashion, taste, colour, lustre, durability, substance or weight, and cheapness. As France has been from time immemorial the seat and origin of fashion, a desirability and priority is thus given to such of her productions as are affected by it over all other countries; and though taste and beauty do not in themselves constitute fashion, yet no fashion succeeds well apart from them. France has been fully alive to this; and to maintain her advanced position, has spared no pains in fostering the art of design, and at the seats of her manufacture every appliance and convenience exist in abundance which can facilitate the application of the skill and taste thus acquired and encouraged, to the articles produced. The silks of Lyons and the ribbons of St. Etienne in the late Exhibition bear testimony to the high excellence thus attained.

Although the British silk manufacturers may not vie with those of France in the production of the highest class of goods, yet, as respects those other qualities referred to which constitute excellence, they are not inferior; and, as regards substance, combined with lowness of price, they may justly claim superiority over all other countries.

Perhaps the proper position and character of the British silk manufacture may be described as the production of goods suitable in price and quality to the greater number of English consumers, and sufficiently rich, varied, and tasteful to form the useful and morning costume of the higher and wealthy classes of society. I have reason to believe that the International Jury of the Class XXI. of the late Exhibition fully appreciated the merit and value of the British silks exhibited in the above-mentioned respects, and so far from confirming the new theory of British decadence in manufacturing skill, considered them a decided improvement on those exhibited in 1851. The medals they awarded attest to the conviction they entertained of their excellence. There were gold medals to,—

MR. WINKWORTH ON SILK MANUFACTURES.

Improvement in British silks.

Awards of the Jury.

1st. Courtauld and Company, of London,
2nd. Winkworth and Procters, of Manchester,
3rd. Kemp, Stone, and Company, of London,
4th. Grout and Company, of London,

seven first-class silver medals, seven bronze medals, and "honourable mention" made of four,—making together no less than twenty-two out of about thirty manufacturers of whose specimens, as exhibited, the jury thought thus favourably. In the case, however, of the gold medals, a larger number having been awarded in the aggregate of the whole Exhibition than the Imperial Commission finally decided to distribute, only one was assigned by them to the clase under review, which was given to the firm first on ths list. It is to be regretted that the Imperial Commission adopted this alternative, as it led to the entire omission of the second and third of the above firms (whose merit the jury, after examination, considered superior) from the lists of medals awarded, to which publicity was given by the whole periodical press of this country. This circumstance, by no means peculiar to this class, is the more to be regretted, as it tends to increase the reluctance which our silk manufacturers already feel to incur the trouble and expense of sending specimens of their productions to international exhibitions,—a reluctance which operated powerfully in the instance of the late Exhibition at Paris, and therefore the limited quantity of silk goods therein displayed could give but a very inadequate and imperfect idea of the value and extent of this important branch of British industry.

I have the honour to be, &c.

THOMAS WINKWORTH.

London, 2 February 1856.

Appendix A.

Mr. Winkworth on Silk Manufactures.

Memorial from the Silk Manufacturers of Manchester to the Right Hon Benjamin D'Israeli, M.P., Chancellor of Her Majesty's Exchequer.

This Memorial showeth,

Appendix A.

Petition for the removal of the protective duty on silk.

That your memorialists are manufacturers of broad silks in Manchester; that the trade in which they are engaged is in a depressed state; that their work-people are not fully employed; and that this branch of manufacture has been almost stationary in extent for a period of ten years at least, whilst every other branch of textile manufacture has largely increased; that they consider the depression and non-extension of their trade to be owing *chiefly* to the limited nature of the foreign demand for their goods; and your memorialists are of opinion, that this is attributable to the protective duty imposed on foreign silk goods imported into this country, the effect of such protective duty being, to create an impression in the markets of the world, that England is unable to compete with the continental manufacturer in the production of silk goods, and thus to throw the export trade almost entirely in the hands of her French and Swiss competitors; that in the opinion of your memorialists, however necessary protection may have been at a former period, it is now positively injurious to them, and they feel that they cannot under any Government, or under any circumstances, long be maintained.

Your memorialists, therefore, pray, that you will be pleased to relieve them, by repealing the duty on foreign silk goods, not *partially* and *gradually*, but *totally* and *immediately*, and thus proclaim to the world that the Manchester silk manufacturer denounces the so-called protection, and every aid a Government can give; that he is prepared to depend solely on his own merit, and that he avows himself capable of taking a higher position in the race of competition, unfettered by protection, than he has hitherto attained under its fostering care.

(Signed)

Harrop, Taylor, and Pearson.
Henry Hilton and Castree.
Makin and Walker.
E. R. Le Mare.
Booth, Lee, and Co.
Jos. Yates, for Charles Hilton.
Thos. Molineux and Co.
T. and E. D. Toase.
Milsom and Clark.
Thos. Lomas.
Brotherton and Dobson.
Winkworth and Procters.
Luke Smith.
Geo. Smith and Sons.
Norbury and Bindloss.
Thos. Brown and Son.
James Bentley.
Wm. Summerskill.
Thos. Ainsworth.
James Garner.
Peter Joynson and Co.
John Chadwick.
Benjamin Lyddall.
John Ashworth and Co., per S. Roberts.
Clough and Meadows.
Hobday and Swanwick.
Henry Cook and Son.

Manchester, November 10, 1852.

Appendix B.

Appendix B.

Austria: Quantity of silk imported and exported.

	1851.		1852.		Sous le nouveau Tarif, 1853.	
	Entrée.	Sortie.	Entrée.	Sortie.	Entrée.	Sortie.
	Kilogr.	Kilogr.	Kilogr.	Kilogr.	Kilogr.	Kilogr.
Soie grège . . .	84,100	189,550	108,650	350,150	149,800	185,450
Soie ouvrée . . .	2,500	1,294,000	2,600	1,502,900	10,400	1,715,450
Soie teinte . . .	600	47,750	2,350	52,250	3,150	58,400
Soieries ordinaires (mixte)	30	28,750	2,300	224,650	2,400	247,800
Soieries fines . . .	100	51,250	9,650	70,350	18,550	143,800

Appendix C.

Prussia: Quantity of silk exported.

L'Exportation de Soieries a eu lieu comme suit :—

	Soie écrue.	Soie teinte.		Etoffe toute soie.	Etoffe mi-soie.
		Ouvrée.	Torse.		
	Quintal.*	Quintal.	Quintal.	Quintal.	Quintal.
1850 . .	2,164	153	232	6,823	5,081
1851 . .	735	33	195	7,547	7,007
1852 . .	1,761	106	240	8,327	7,389
1853 . .	1,683	73	196	11,752	10,428

Quantity of silk imported.

L'Importation de Soieries a eu lieu comme suit :—

	Soie écrue.	Soie teinte.		Etoffe toute soie.	Etoffe mi-soie.
		Ouvrée.	Torse.		
	Quintal.	Quintal.	Quintal.	Quintal.	Quintal.
1850 . .	13,434	309	1,402	3,175	2,023
1851 . .	14,870	316	1,363	3,316	1,944
1852 . .	15,871	338	1,374	3,383	1,981
1853 . .	17,753	406	1,620	3,631	1,857
1854 . .	17,896	—	—	4,002	1,884

* Ou 50 kilogrammes.

On FURNITURE and DECORATION, as comprised in CLASS XXIV.—By M. DIGBY WYATT, Juror in that Class.

MR. WYATT ON FURNITURE AND DECORATION.

MY LORD,

THE objects comprised in the Official Catalogue under the head of Class XXIV., although all avowedly connected with furniture and decoration, were of so anomalous a character, that one of the earliest acts of the Jury was to hand over, to receive the verdict of other classes, many objects with the technical details of which they were not sufficiently acquainted to arrive at just conclusions. Probably the most important among such objects were a variety of woods, marbles, and other materials, which should have more properly fallen under the notice of either the Vegetable Substances', the Mineral Products', or the Civil Constructions' Juries; and a quantity of trifles and toys; which should more correctly have been classified with objects of fancy and small wares. As the Jury of Class XXIV., however, entered on its labours, from day to day its members found scattered in every part of the building objects upon which the exhibitors themselves claimed their verdict. Stoves and grates, for instance, which had been classed variously as instruments for procuring warmth, light, or ventilation, and as specimens of bronze or iron casting, were all ultimately referred to Class XXIV., to receive a fine art rather than a scientific criticism. In consequence of these and similar interchanges, the number of exhibitors in the class shown by the Official Catalogue must not be assumed as correct; it may, however, be accepted as indicating approximately the relative position of the industries of furniture and decoration in the various countries represented at the Exhibition. There were in the departments of—

Defective classification of the Official Catalogue for practical purposes;

transfer of of objects from Jury to Jury consequent thereon.

Number of Exhibitors in Class XXIV., as given by the Official Catalogue.

	Exhibitors.
France	277
Algeria	3
America	3
Duchy of Anhalt Dessau and Coethen	1
Austria	38
Grand Duchy of Baden	4
Bavaria	8
Carried over	334

	Exhibitors.
Brought forward . .	334
Belgium . . .	21
Switzerland . . .	10
Denmark . . .	8
Spain	5
England	77
Greece	1
Hanover . . .	1
Hanse Towns . . .	8
Grand Duchy of Hesse . .	1
Principality of Lippe Detmold .	1
Mexican Republic . .	1
Holland . . .	24
Papal States . . .	5
Prussia	33
Sardinia . . .	19
Tuscany . . .	26
Wurtemburg . . .	8
Total . . .	583

Additional number brought under the notice of the Jury of the Class.

The minutes of the meetings of the Jury show that they examined and voted on the claims of about 200 exhibitors over and above the total number given in the catalogue; the principal component parts of the excess being derived from France, England, and India.

General impressions as to the progress manifested by the principal competing nations.

A superficial glance over the leading objects was, it appeared to me, sufficient to convey the impression to the minds of the Jury, that as compared to their relative positions in 1851, France and England had made most progress, Austria and Tuscany had lost most ground; the Papal States, Canada, Belgium, and Hamburg amongst the Hanse Towns, had steadily improved, and that the remainder had neither strikingly advanced nor receded. Taking the bulk of the goods exhibited, it was impossible not to be struck by, the fertility of design, generally admirable, but now and then verging on the ridiculous, and the excellent manipulation of the French; the extreme inequality of the English, who in one set of specimens touched nearly the highest point of refinement both of idea and execution, and in others sank down into clumsy and heavy commonplace, as though art was too exceptional amongst us; the usual technical perfection of the German, with a dry hard style in the northern, and a florid but clumsy imitation of old French in the southern; the novelty and freshness of inspiration which

were to be derived from the Indian, Chinese, and Oriental; and the lingering, flickering light of her ancient traditions of beauty still hovering about the embers of Italy.

MR. WYATT ON FURNITURE AND DECORATION.

According to the system of classification adopted by the Imperial Commission, the objects comprised in Class XXIV. were grouped in ten sections, under the following heads:—

System of classification of the objects comprised in Class XXIV. as adopted by the Imperial Commission;

I. Objects of furniture or decoration having stone or marble as a basis, including carving, mosaic working, artificial stones and pastes, scagliola, &c.

II. Objects of furniture or decoration having metal as a basis, including iron and brass bedsteads and chairs, ornaments for application to furniture, wire work, &c.

III. Current furniture having wood as a basis.

IV. Furniture having wood as a basis, involving the use of precious materials, and complicated processes such as marquetry, buhl cutting, &c.

V. Objects of furniture or decoration in any materials prepared for surface treatment by lac-work, gilding, varnishing, &c., including papier-maché, carton pierre, &c.

VI. Objects of and utensils for furniture, having as a basis animal or vegetable substances other than woods, such as matting, cane-work, plaited grasses or straw, horsehair, &c.

VII. Upholstery, including all materials for and workmanship in beds and bedding, window blinds, hangings, &c.

VIII. Ornamental papers of all kinds for walls, packing binding, and other uses, transparencies, &c., leather work.

IX. Decorative painting, including imitation of woods, marbles, &c.

X. Furniture and decoration for churches of every kind, and in any material.

and as modified for greater perspicuity in this report.

In reporting on the class, I shall adhere as far as possible to the above classification; but, feeling that a clearer idea of the whole subject may be conveyed by taking the sections in the order of their relative importance and obvious connexion with one another, instead of by adhering to the artificial and, perhaps, more scientific grouping of the

Mr. Wyatt on Furniture and Decoration.

Imperial Commission, I propose to arrange my remarks in the following order :—

A. Furniture.

A.—Furniture.

Sections III. and IV. *Current and precious furniture in woods.*

[It is almost impossible to draw a practical line between these two sections, because furniture which is "current" in the upper classes, is "precious" in the lower, and what would be precious in some countries of Europe would probably be quite "current" in France.]

Section II. Furniture in metal.

Section I. Furniture in stone and marble.

Section V. Furniture in lac, &c.

Section VI. Furniture in animal or vegetable substances, other than woods, and appurtenances to furniture.

B. Upholstery.

B.—Upholstery.

Section VII. Upholstery.

C. Decoration.

C.—Decoration.

Section VIII. Ornamental papers and leathers.

Section IX. Ornamental painting.

Section X. Furniture and decoration for churches.

Precedence given to France;

The incontestable pre-eminence of France in many sections of Class XXIV., as well as the fact of her having been by far the largest exhibitor, suggests the propriety of giving precedence to an analysis of all that appears most remarkable in her contributions.

in this report.

I shall, therefore, commence my notice of each section by an examination of her industrial position and productss taking England next in order, for the sake of comparison and contrast. Germany and the remaining nations I propose to review in what appears to me their relative order of merit.

Entering, therefore, upon the general division of A. Furniture, in its special shape of—

French Furniture in woods.

Sections III. and IV. *Current and precious Furniture in Woods*, it is to France that we have first to look.

The present style;

The extreme eclecticism of her style at once strikes the observer; eminently original as the designs of many of her products at first appear, on a careful examination in almost every case, they will resolve themselves into a series of happy

historical recollections of the curious transitional change, through which Parisian fashion has passed. In one and the same piece of furniture often may be seen carving à la Jean Goujon, marqueterie à la Riesner, beautiful brass work à la Gouthière, coupled with a free and tasteful rendering of foliage, wrought in almost direct imitation of nature. Of late years the Government has done all in its power to preserve the traditions of technical excellence which have characterized every period of French history, and I firmly believe, from the evidence afforded by the furniture itself of the present day, that there is no one style or process which has ever existed in France, that the leading French artist-workmen do not now practise, with a success almost equal to that attained by the best of their predecessors.

Mr. Wyatt on Furniture and Decoration.

founded on traditions of technical excellence;

the preservation of which has been fostered by the Government;

It may not be unprofitable to trace the Government influence in the various channels through which it has assisted the development of cabinetmaker's work in France. It was to no less a Minister than the great Colbert that France was indebted for the first step which laid the foundation of her modern pre-eminence in the manufacture of furniture. He it was who collected from every district of his own, as well as from other countries, the best cabinetmakers and upholsterers that could be met with, and by an edict of the year 1667, established in the Hôtel des Gobelins, the "manufacture royale des meubles de France." It was of this factory that Boule appears to have been the worthy head, and from it issued those magnificent pieces of furniture which decorated Versailles, St. Germain, Marly, St. Cloud, the Louvre, and the Tuileries; and of which the few relics that have escaped the fury of revolutions, even in the present day serve as the models upon which much of the taste of the recent cabinetmaker's work of Paris is based.

from the time of Louis XIV.;

Under Louis XVI. and Marie Antoinette the genius of Riesner and Gouthière was fostered and brought to maturity; and after the fatal blow was given to advancement by the revolution, it was to the enlightened patronage of Napoleon I. and his Ministers François de Neufchatel and Chaptal, that the talents of Percier and Fontaine, the architects, were brought to bear upon the design of that furniture, which was so admirably carried out by the celebrated Jacob. There can be no question that the establishment of a ministry of commerce has produced a great influence upon French manufactures, including, of course, that now under consideration. Under the Restoration and Louis Philippe, six excellent systems have been permanently

to the present.

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adopted, which are thoroughly well sustained under the present Emperor:—

Government encouragement now afforded to Schools of Design;

1st. The encouragement of Ecoles de Dessin Lineaire, with proper courses of "Geometrie appliquée aux Arts, &c."

technical museums;

2nd. The formation and gratuitous opening to the public of technical museums of antiquity, such as portions of the Louvre, the Hôtel Clugny, the Musée d'Artillerie, the Cabinet des Médailles, Sèvres, and the local collections in the departments, such as at Rouen, Lyons, Nismes, Montpelier, &c.

costly publications;

3rd. The systematic support by subsidies and by purchasing numbers of copies for general reference, of the publication of examples of art calculated to furnish good models to the manufacturer,—such as Willemin's "Monuments Français," Asselineau's "Armes et Armures Meubles, &c." Chapuy's "Le Moyen Age Pittoresque," Du Sommerard's "Les Arts au Moyen Age," Lacroix and Seré's "Moyen Age et la Renaissance," and "Arts Somptuaires," Sylvestre's "Palæographie Universelle," &c.;—works, which but for Government patronage would probably never have been undertaken.

deserving producers;

4th. By taking care that every purchase, made for the fitting up of any of the Government or municipal establishments, was guided by the best taste, and determined by considerations of excellence rather than economy. The amount of patronage, thus judiciously bestowed, has proved a most salutary encouragement to many an artist, struggling to improve upon the productions of his wealthier fellow producers.

competition, as measured by intelligent juries;

5th. Adhering to the principle of the quinquennial expositions, and taking care, by the operation of intelligent juries, to insure an investigation into, and recognition of, every fluctuation in production, and every appearance of legitimate novelty or improvement.

and philanthropic projects for bettering the condition of the working classes.

6th. Keeping an anxious watch over the moral and physical condition of the working classes, rewarding every effort, emanating from themselves, made for their social elevation and well-being, and taking pains to find out and reward merit, in any shape in which it can be met with, among either men or masters.

Irregularities of such encouragement in England.

To such system we unfortunately have but little to offer in contrast, excepting accident; and too often what little

good is done, is done by stealth, and in fear lest the slightest exercise of zeal should bring its exerciser into trouble, instead of assuring him sympathy and approbation; added to this in almost every matter of national expenditure affecting art and industry, we are continually sacrificing ends to means.

Fine Art brought to bear upon industrial art in France; more especially sculpture;

Fostered as French cabinetmaking has been by the governing powers, we can be but little surprised to find it in the present day allied in a most intimate degree with what cannot be looked upon as other than fine art. Sculpture now plays so important a part in the production of almost every piece of furniture of any pretension, that any notice of the manufacture would be sadly imperfect, if it did not take cognizance of this hereditary connexion, which has now existed almost uninterruptedly in France for many centuries. Previous to the 16th century, much carving appears to have been applied to the production of the old oak fittings of the churches and châteaux, but principally in the conventional style common to the works of the later mediæval ages. Sculpture of a pictorial nature, and conducted on the principles of the antique, was scarcely at all made use of until the spirit of the revival had taken firm hold of the national taste.

how connected with furniture from the 16th century;

It was during the reigns of Charles VIII., Louis XII., and the first part of that of Francis I., that those delicate arabesque enrichments, those graceful scrolls and vases, and that contrasted high and low relief of tender ornamentation, which characterize the purest age of the French renaissance, were principally in vogue. When the influence of the school of Michael Angelo introduced a more ambitious style into France, the arabesques disappeared, and scrolls and flowers took their place; but though the drawing and composition of the figures were improved, the ornaments gradually became heavier until the end of Henry II.'s reign. Mythology, though often found in ludicrous connexion with sacred subjects, more frequently usurped their place. The art of wood-carving was, however, still exercised by the great Renaissance masters:—thus, the doors of St. Maclou at Rouen were executed by Jean Goujon, as well as many of the decorations at the Château d'Ecouen, and the designs for the carved wood ornaments at Fontainebleau were made by Giulio Romano and Primaticcio. The museum of the Hôtel Clugny contains an *armoire* or large cupboard of walnut-wood, ornamented, like most of the *armoires* of that time, by caryatides; this piece of furniture was made and presented to the Abbot of Clairvaux by his monks in Henry II's. reign.

through the period of the renaissance;

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to that of Louis XIV.;

Though many of the wood fittings at Versailles and St. Cloud have much of the splendour which mark the earlier part of Louis XIV.'s reign, a mannered and less refined style pervaded Europe during the greater part of the 17th century. In the reigns of Louis XIV. and XV. wood-carving was chiefly applied to furniture, altar decorations, or the execution of large gilt candlesticks; many, however, of the smaller works of art of this period are really good; they consisted principally of portraiture in the manner of Bernini, delicate imitations of flowers, groups of figures in le style bergèr, occasionally from the antique; little figures of beggars carved half in wood and half in ivory; and occasionally of statuettes in the style of Girardon; even these ceased at the great Revolution, and wood-carving did not begin to revive till the Restoration.

and the Revolution.

It would, however, be scarcely fair to the memory of a great man to overlook the extraordinary talents of Demontreuil, who was probably one of the best wood-carvers who ever lived. He fell upon evil days, for he had to struggle for his livelihood through the turmoils, miseries, and heart-burnings of the great Revolution.

I now proceed to offer a few observations upon the—

Statistics of the Recent and Modern Furniture Trade in France.

Statistics of the trade in France;

Furniture joinery is so closely connected with cabinet-making that they are commonly spoken of as the same thing. The more common woods are used in furniture joinery, whilst in cabinetmaking the most valuable woods, either solid or veneered, are employed. The cabinetmaker, in preparing the various portions of his work, employs the several trades of carvers, veneer cutters, turners, inlayers, &c., the fitting together of whose work is done by the cabinetmaker. According to the valuable results of the inquiries made for the Chamber of Commerce of Paris in 1851, it appears that in that city and in that year the

Number of workmen employed 1851;

number of master cabinetmakers amounted to 1,915, 178 of whom employed more than 10 workmen apiece, 844 employed from 2 to 10 workmen, 448 employed 1 only, and 445 worked single-handed. The value of the business in 1847 is said to have amounted to 27,982,950 francs; and the aggregate number of workmen engaged to about 8,559, 6,386 working by the piece, 2,173 working by the day, 13

and their wages.

working in other ways. Their daily wages were received in the following division: 162 received above 5 francs, 8,390 received between 3 and 5 francs, 7 received below 2 francs, these last having been men in distress. The

maximum pay was 10 francs, the minimum 1·25 franc per day. The larger salaries were received by the superior trades, such as carvers, decorators, &c. To this list should be added 340 boys and 90 women and girls; of the latter 64 received wages, 36 by the piece, 28 by the day; their maximum pay was 4 francs, and their minimum 1·25, the mean rate being 2 francs. These females were mostly varnishers.

Number of masters in 1851.

The greater number of master cabinetmakers in Paris appeared to belong, as they now do, to the 8th Arrondissement, where, to the number of 1,093, they manufactured chiefly for the supply of the retail furniture sellers; the other arrondissements contain the remainder.

With these details of the state of the cabinetmaking trade in the capital of the French Empire at the period of the last Universal Exhibition, it is singularly interesting to contrast the latest data I have been able to obtain.

Comparison of the above details with those of 1855.

M. Wolowski, the well-known Professor at the Conservatoire Impériale des Arts et Métiers, and reporter for the class to the French Government in 1851, has recorded the fact that during this last year (1855) Paris alone has occupied between 25,000 and 30,000 workmen in cabinetmaking and the businesses dependent upon it. He values the work produced in the whole at 81,000,000 francs, or about $3\frac{1}{4}$ millions sterling, thus divided amongst the various trades:—*

	Francs.
Furniture joiners and carpenters	30,000,000
Chair and sofa makers	5,000,000 +
Marquetry and fret cutters	1,200,000
Wood carvers	1,200,000
Furniture carvers (less artistic)	1,000,000 +
Bed makers	3,500,000
Marble workers for furniture	2,000,000 +
Sawyers and wood merchants	2,500,000
Upholsterers	21,000,000
Turners for chairs and sofas	2,000,000
Billiard-table makers	1,400,000
Frame makers and moulding runners	4,000,000
Gilders on wood	5,000,000 —
Cane plaiters	250,000
Ornamental turners	1,000,000 —
Total	81,050,000 —

* The signs + and — set against each set of figures show respectively, + that the real amount is in excess of that stated, and — that the real amount is slightly less.

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Influence upon the trade of the troubles of 1848.

In the unfortunate troubles of 1848 this trade suffered more than others. The value of the business fell from 27,982,950 francs to 6,436,067, a reduction of 77 per cent., and out of the 9,046 workmen previously employed, 7,014, or 78 per cent. were discharged in March and the three following months. The greatest sufferers were those working on their own account; and the minor masters' prices fell 25 per cent., in consequence not only of the interruption to trade, but also of a glut of the more common articles of furniture, caused by the attempts of those thrown out of employment to produce them at their own risk.

Habits of the trade.

There is a peculiar tendency amongst cabinetmakers to become makers on their own account. When they have saved a small sum, or, being out of work, can obtain credit from a wood merchant, they begin manufacturing for their own sale; but being compelled, from want of sufficient capital, to sell their goods at once, and having no place where they can show them, they are obliged to dispose of their stock by hawking. In the morning the cabinetmakers will make their way towards the Rue de Cléry and the Temple, from the Faubourg St. Antoine, laden with the furniture they have been making; they often wander about all day, offering their goods but selling nothing, and at last, unwilling to return home without the means of paying, for the materials procured on credit, or their own support, they are compelled to dispose of their work at a low price. Often, too, being unwilling to lose time which might be more profitably employed, they have recourse to the commissionaires of the Faubourg St. Antoine, who are associated together, and, if the speculation is likely to pay, these men will purchase on their own account; if not, they hawk it about, and dispose of it on commission to the highest bidder.

The manufacturers attribute to this species of trading the great reduction which has taken place in the price of articles of furniture of late years, and many complaints are made of it. It seems to have arisen from the want of capital among the minor masters, and those undertaking the execution of work; being compelled to seek quick returns, they were obliged to sell at almost any price, and to the competition arising from this the makers must all submit.

During the interruption of trade in 1846 this particular cause of lowness of price fell heavily on the cabinetmakers; the great number of workmen, who had become makers on their own account, losing all their savings by being compelled to sell when trade was all but at an end; their sufferings were very great, and those, the greater number,

who had wives and children, were only supported by the assistance of the mairie.

Workmen's associations.

Workmen's associations have arisen from the great tendency amongst them to establish themselves as manufacturers on their own account, and the difficulty of succeeding without sufficient capital. One of these associations, formed October 1st, 1848, obtained from the commission charged with the division of three millions voted by the National Assembly for this kind of help, a credit of 75,000 francs. Other associations have been formed amongst the workmen, with the wood merchants as secure partners, who in that way endeavoured to get rid of their stock. In the present Exhibition two associated bodies of workmen exhibited exceedingly good products, so far as work was concerned, one in general furniture, the other in chairs alone. The greater part of the workmen are responsible and hardworking; very many, however, are dissipated, though not commonly drunkards, and many will not work on the Monday. A great number of the workmen may be termed migrating, and these are chiefly Germans, the immigration of whom has been great during the last twenty years, and, as a considerable number have not returned to their native country, they now form an important portion of the settled population of France. The quarrels which, for some years subsequent to 1830, arose between the French and German cabinetmakers, and which compelled the masters to choose their workmen exclusively from one or the other nation, seem now to be at an end; and a perusal of the list of exhibitors shows in how great a degree the industry of Germans, from Messrs. Grohé downwards, tends to sustain the reputation for elegant workmanship acquired by the "Mode Parisienne." They seem fully to sustain their old reputation for buhl and marquetry work, and to incline by preference to that branch of the trade.

Character and habits of the workmen.

Exports and imports.

I have unfortunately failed in obtaining any official statistics as to the recent exports and imports of furniture from and to France. I have, however, been assured by those who should know, that about one third of the total value of the cabinetmaker's work annually produced is got up for exportation; that America, North and South, is by far the largest customer; that exportation to England has not kept pace with the increase of the trade generally; and that we do not take from France as much as 40,000*l.* worth annually. In 1836 we took 10,000*l.* worth.

Inclination of the French to "petitesse."

There is one social peculiarity among the French which has done much to foster a taste for luxurious furniture, that

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is, their predilection for small apartments. An exquisite of the present day will be satisfied with a domicile upon the smallest scale, provided he can fit it up with "*recherche*;" and frequently a few rooms of very limited dimension will have as much money spent upon their decoration and furniture, as would suffice to build and furnish, in a simple style, a whole house of three or four times the same amount of accommodation.

French cabinet-makers who obtained great gold medals of honour; M. Fourdinois;

I proceed to offer a few remarks on those of the *French exhibitors of furniture* whose productions have either been honoured by gold or silver medals, or have appeared to me to involve principles or processes of importance.

First in rank unquestionably, and well deserving of the great medal of honour it received, stood the house of Fourdinois, whose exhibition on the present occasion formed a worthy sequel to, and improvement on, its display in 1851, for which, it will doubtless be remembered, it obtained a Council medal. The largest and most costly specimen exhibited by the firm was a chimney-piece in oak, of a truly monumental character. With the exception of some trifling error of judgment in the placing of the gilt bronzes which decorated its lower frieze, and a slight exaggeration of the style of Donatello in the principal bas-relief, I am not aware that any serious reproach could be made either to the design or execution of this princely piece of furniture. Conceived in the florid style of Italian renaissance, the work was alike free from either poverty or over-elaboration of treatment, and its design, although never transgressing the conditions of the style, was yet in every respect original. The life-size figures which formed the supporters to the central bas-relief, were in my opinion the finest I have ever seen carved in oak, ancient or modern. It is a true pleasure to be able to record the names of the artists who contributed to the perfection of this and of the other specimens of M. Fourdinois' ability. The principal were as follows—M. Parti, sculptor; M. Vervillier, designer; M. Megret, senior, who has been in the service of the house upwards of twenty years, principal wood carver; and MM. Hillier, Dujardin, and Le Parmentier, foremen and chief artist-workmen. While his grand chimney-pieces showed how far M. Fourdinois could carry the application of carving to furniture on a large scale, his exquisite cabinet in the style of Jean Goujon, in oak, and his ebony bookcase inlaid with fine enamels, proved the success with which he could adapt his art to more limited dimensions. The former of these two objects appeared to me, on the whole,

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the most faultless specimen of florid furniture in the entire Exhibition, and I sincerely rejoiced to find that it had been purchased for the Museum at Marlborough House. An escritoire in Thuya and other Algerian woods, purchased by his Grace the Duke of Hamilton, was almost entirely divested of ornament; the woods were, however, so admirably selected, and adjusted with such perfection in the mouldings and mitres, that, although exhibited for some few days anonymously, its merits had so far attracted the attention of the jury that they had agreed in placing it at the head of all the simple cabinetmaker's work displayed.

M. Barbedienne.

The only other exhibitor of furniture rewarded with a grand medal of honour was the well-known M. Barbedienne, who reproduced the grand cabinet in imitation of ebony, which had gained him the Council medal at London in 1851, adding to it another cabinet in walnut, of about the same size, and of even more graceful and excellent design. Avoiding rivalry with M. Fourdinois and many other exhibitors in the application of elaborate sculpture in wood, M. Barbedienne allowed enrichment in that material to be in a great measure replaced by those faultless bronzes of which he is the unrivalled manufacturer. The great merit of his work, and one in which no other exhibitor equalled him, consisted in the severe study of the proportions of the different parts, and more especially of the mouldings. In simple harmonious architectonic design, M. Barbedienne's cabinets surpassed everything in the building; and the truth of the work, coupled with the refined subordination which reigned over the several projections of the various conventional ornaments and enriched surfaces, rendered them worthy of the English cabinetmaker's most attentive study. M. Barbedienne's principal assistants were M. Clésinger, the celebrated sculptor; M. Manguin, architect; and M. Guyon, foreman.

French cabinetmakers who obtained ordinary gold medals;

In the class of ordinary gold medals France gained two for cabinetmaking, one of which was carried off by Paris, and the other by Bordeaux.

MM. Grohé Frères of Paris;

The Parisian was obtained by the well-known house of Grohé Frères. Veterans of the industrial arenas, these worthy brothers have already obtained every distinction to which upright conduct, good taste, and excellent manufacture should entitle them. In their various productions they showed an accurate knowledge of style without servile imitation, a wise avoidance of ultra-decoration without poverty, and faultless execution without either avoiding the difficulties of their art or going out of their way to create and encounter them. Their ability in

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sculpture was best shown by a truly remarkable little pendant lamp, carved in walnut wood; while their capital piece, as a specimen of finish in gilt bronze decoration, was a noble cheffonier, principally in tulip wood. In 1849 they had gained distinction by their perfect treatment of ebony; and they took care, in the present exhibition, to sustain the reputation so earned, by a bureau of admirable workmanship in that difficult material. MM. Grohé recommended to the attention of the jury, as their principal assistants, MM. Chabrot, sculptor, and M. Henri Penel, their foreman during the last twelve years.

M. Beaufils of Bordeaux.

The Bordeaux gold medal was obtained by M. Beaufils, who has, within the last few years, succeeded in organizing in that city a colossal establishment for the fabrication of furniture for exportation. The foundation of the rapid increase of this establishment may no doubt be referred to the depression of trade, which, in 1848, drove so many first-class workmen away from Paris. M. Beaufils, who was at that time in a large way of business, profited by the opportunity, and greatly extended his trade. When the revival of the trade recalled many of his Parisian workmen to the metropolis, he very wisely visited Italy, and succeeded in inducing a considerable number of the best Milanese and other workmen to join his staff. By their aid, and by his own energy and talent, he has commenced a large shipping trade, in a showy, but at the same time really good style of furniture. Although not finished with the perfect refinements of Paris, the large walnut bookcase, the cabinets inlaid with pietra dura (made by Milanese workmen at Bordeaux), and the cheffoniers in tulip wood with gilt mountings, were all of good quality, and produced at prices which, considering the materials and workmanship, neither of which were in anywise *scamped*, were truly remarkable. I was assured by a merchant who had sent a considerable quantity of M. Beaufils' goods to South America, that they had stood both the voyage and climate exceedingly well. A consideration of these qualities, coupled with the fact of M. Beaufils having created a considerable export trade from Bordeaux in an article not previously manufactured to any extent in the town, induced the jury to award him the distinction of the gold medal of honour.

French cabinet-makers who obtained silver medals;

Among those who received silver medals are many whose merits may be summed up in a line, others exhibited goods which merited more detailed observation. At the head of the list I should unquestionably place—

M. Jeanselme;

Jeanselme, for the undeniable excellence of his work in every object exhibited. His capital specimen was a cabinet,

designed, and partially carved, by Lienard; it was very good; but on the whole it was rather for the equal excellence of the ensemble of his exhibition, that M. Jeanselme was rewarded, than for especial merit in any one article. M. Jeanselme's workshop is a model establishment, and appears to be admirably conducted. The jury visited it, and traced the progress of a piece of furniture from the entry in the order-book to the issue of the "meuble" complete from the hands of the French polisher. On that occasion I saw for the first time, in a cabinetmaker's workshop, an endless saw, travelling in one direction only, thereby saving the time and force of the back motion of the saw. It was exceedingly simple, consisting only of a thin and very elastic steel band, serrated on the edge, made to take the place of a leather or gutta percha driving band, and consequently travelling over two driving wheels in swift motion. The wood is slipped along a table, the plane of which is at right angles to the vertical line of the saw, against which it is pushed, being thereby cut with extraordinary rapidity. It is superior to the circular saw, as it admits of the wood being cut to a line of much smaller radius, and it makes much less scattering of sawdust in the workshop.

Charmois showed some good furniture, with a tasteful inlay of bronzes and green marble. M. Charmois;

Fossey, who was formerly associated with Fourdinois, and some years ago an assistant with Mr. J. G. Crace in London, is an excellent sculptor, and exhibited a gun stand, admirably made and carved, but somewhat disjointed in its balance of parts. M. Fossey;

Meynard showed a walnut bookcase with black mouldings, of good design, and covered with carving of very tasteful execution. It was one of the best purchases made by the Emperor. M. Meynard;

Hofer contributed a quantity of furniture, principally made of Algerian woods, in the treatment of which he showed himself an adept; his metal inlayings were good, and his prices exceedingly moderate. M. Hofer;

Bruland exhibited a bookcase in rosewood, also bought by the Emperor. A model of quiet elegance without pretension. M. Bruland;

Ribaillier and *Mazaroz* sent a carved gun stand, decorated with figures of hunters of admirable sculpture, second only to the figures of Fourdinois. The aspect of the piece of furniture was injured by the introduction of some painted panels, of less merit than the sculptures. MM. Ribaillier and Mazaroz;

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MM. Gueret Frères;

Gueret Frères exhibited a piece of furniture of very questionable design, having dogs chained to the lower part, as in the great sideboard of Fourdinois in 1851, but decorated with wood carvings of dead game, and other subjects demanding the most exquisite finish. A minute comparison was made between the works of M. Gueret and those of Wallis of Louth, and ultimately precedence was given to the former, principally on account of his greater taste in the execution of the plumage of the birds.

M. Rivart;

Rivart is the originator of the incrustation of porcelain flowers, &c., cut out and painted in imitation of nature in wooden and marble grounds. His productions showed a considerable advance upon what he brought forward in 1851. In a very luxurious private house at Paris I saw some pilasters executed by M. Rivart, in which the arabesques were inlaid in china upon an ebony ground, and the effect was singularly brilliant.

M Balny;

Balny showed a good oak sideboard, well fitted up and carved.

M. Roudillon.

Roudillon I should certainly place in merit next to Jeanselme among the silver medallists. His chimney piece in oak, with panelling forming the complete side of a room, for the design of which he had availed himself of the genius of M. Feuchère, was truly noble in style and execution; somewhat more architectonic in style than our Roger's carving generally is, it was quite worthy of him in its breadth of execution. M. Roudillon is the successor to Ringuet le Prince, who figured so creditably in 1851, and appears determined to sustain the reputation of the house.

Principal French cabinet-makers who obtained bronze medals;

Among those cabinetmakers who obtained bronze medals, there were not many whose products involved important practical lessons for us, the principal, however, were—

M. Jeanselme Jeune;

Jeanselme Jeune, whose chairs were models of excellence in the application of refined carving.

M. Sicard of Lyons;

Sicard, of Lyons, who showed what could be done in the second city of France.

MM. Rahon and Roll;

Rahon and *Roll*, who exhibited excellent beds in black wood.

Madame Osmont;

Osmont, who also sent a very handsome carved bed.

M. Ouvrier Père;

Ouvrier Père, who contributed a model counter for a cabaret.

M. Archambault;

Archambault, whose gadrooned and ornamented mouldings, wrought after the manner of the celebrated Hans Schwanhard, who lived early in the 17th century, attracted much observation.

Madame Brag, whose upholstery was capital, and very moderate in price. Her business is probably the most extensive in Paris in her own line. Madame Brag;

Beurdelet, whose imitations of Louis XVI. furniture amount almost to fac-simile reproduction. And, M. Beurdelet;

Eloy Dupont, whose *specialité* is the imitation of Gouthière brass fittings. It would be scarcely possible to carry refined chasing and parcel burnishing to greater perfection. In connection with the preparation of these metal finishings, which form a graceful ornament to furniture, it may be well to notice here the importance of an experiment lately made by the firm of Christofle et C ., the Elkington's of Paris, to reproduce the most perfect "ciselure" by electro-galvanism. They this year showed a pair of *gueridons*, decorated "à la Gouthière," so perfectly as to deceive all but the very best connoisseurs, and for sale at the price of about one sixth of what they would have been, had the ornaments been finished by hand. M. Eloy Dupont; MM. Christofle et Cie.

I have purposely excluded from notice hitherto the skilful practitioners of the arts of marquetry and boule or buhl work, because I feel that they are subjects of such importance to our present condition of cabinetmaking as to deserve a careful separate notice. What enamelling and damascening are to metal work, *marquetry and buhl* are to wood work—the most graceful means of adding the charms of colour to those of form; hence I have not scrupled to go at some length into the details of both processes, which I earnestly desire to see popularized amongst us. Marquetry and buhl.

Marquetry, which is a species of mosaic in or upon wood, appears to have been acquired from Byzantium by the inhabitants of Tuscany, where, from a very early period, that peculiar style of stone and marble mosaic known as "Florentine" had been practised. Marquetry was much used in the decorations of churches and palaces, by the ecclesiastics and rich merchants of Florence, Sienna, and Pisa, as well as in their furniture, in which great richness of ornament prevailed; and there still exists a series of pictures in the chapel of the Palazzo della Signoria at Sienna, said to have been designed by Taddeo Bartolo, in the beginning of the 15th century, and executed in black, brown, and light coloured woods. Marquetry probably learnt by the Italians from the Greeks.

Vasari tells us of many such works by the old masters, which, known to the moderns as "*Lavori di Commesso*," were described by the earlier professors of the art as "tarsia." He observes that, "the best works which have Vasari's notices of the best workers in marquetry.

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been made in this manner were executed in Florence, in the time of Filippo di ser Brunellesco, and especially by Benedetto da Maiano. This artist, like all his predecessors, had in his works employed dark and light coloured woods only; it was reserved for Giovanni da Verona to extend the art, by giving various artificial colours to the materials used, by means of waters, coloured infusions, and penetrating oils. To obtain brilliant high lights, he was accustomed to use delicate slips of willow." Vasari further tells us that some artists deepened their shadows by the application of hot irons; others obtained the desired tints by the use of oil of sulphur, and compounds of arsenic and corrosive sublimate. Fra Damiano adopted the latter process in his celebrated works in the Church of San Domenico, at Bologna.

Fra Damiano da Bologna.

Fra Giovanni da Verona.

Probably the purest and most artistic marquetry of the 15th century, is that executed by Fra Giovanni da Verona in the stalls of the church of Sta. Maria in Organo, in that city.

Transfer of the manufacture from Northern Italy to the Free Cities of Germany;

It was through the great commercial intercourse that took place between Venice and the leading cities of Northern Germany, that the art of inlaying cabinet work, which had been carried by the above and many other artists to such perfection, in the churches and palaces of the north of Italy, was imported into the rest of Europe. Augsburg and Nuremberg imitated the splendid wood-work of Venice, Verona, and Bologna, as they had already, at the commencement of the 16th century, learnt to do the metal work of Milan and Ferrara. Those singular and interesting cabinets, some of which, under the title of Kunst-shranken, still form the principal ornaments of the museums of Dresden, Berlin, and Munich, were executed in the free cities of Germany, in imitation of old Italian work; while in France, the ebony sculptures in low relief, for which Venice had become celebrated, were more especially sought after, and reproduced by the best French wood carvers of the period of the Renaissance. The laborious processes of inlaying in precious metals and other materials, demanding extreme minuteness of treatment and endless patience, proved to be exceedingly congenial to the spirit of the Germans. and the art was carried by them to the greatest perfection, After the decay of the great old cities of the Fuggers, and other merchant princes of the 16th century, the tide of manufacture set in towards the Rhine, and it was at Neuwied, near Cologne, that the great establishment for marquetry was founded, from which issued probably, from

and ultimately to Neuwied.

about 1650 to the latter part of the last century, an infinite variety of specimens of furniture, tastefully enriched by that process. Such dexterity had been arrived at by the workmen of that factory, that they were enabled to convert the floor of a large apartment for Prince Charles of Lotharingia into a lively picture of the Rape of the Sabines.

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The wars and troubles which have befallen Germany have done much to obliterate the traces of their great skill in marquetry; and it is principally through the works of their imitators, the Dutch, that we can trace the style of the Neuwied school. By far the greater part of the old inlaid furniture which is now being brought into this country is of Dutch manufacture. Much of it is very coarse, in large scrolls and flower patterns, which are only made presentable by being delicately engraved over with fine lines, into which a stain or mastic is rubbed so as to represent the drawing of the various parts of the flower or ornament represented. It is a great pity that much of the ingenuity and dexterity which are now brought to bear in "doctoring up" old foreign work, should not be devoted to the improvement of our contemporary productions.

Dutch marquetry.

The names alone of Boule or Buhl and Riesner point significantly to the Teutonic nationality of those by whom the furniture of the old court of France was made so renowned. The former of these two celebrated cabinetmakers was born in 1642, and died in 1732. So highly were his abilities appreciated, that he was appointed to the office of "Tapissier en titre du Roi." He was a man of elegant taste, as the design and carrying out of all his noble pieces of furniture prove, and was much noticed by Bernini on the occasion of his triumphant visit to Paris. It was through Bernini that Boule obtained orders for important works at the Louvre. As a recreation Boule accumulated a very fine collection of drawings and engravings by the old masters: they were unfortunately destroyed by fire in the year 1720, and among them, no doubt, perished many beautiful sketches by Berain, who was the most graceful designer of his time, and furnished Boule with the drawings for much of his magnificent furniture. Riesner occupied a corresponding position in the succeeding generation, having been the "Ebeniste de Louis XVI." Buhl was unquestionably a man of great originality, and probably invented the processes for executing the peculiar work which bears his name, and to which I shall presently allude. Riesner's talent principally consisted in ensuring in all his works the most exquisite technical finish, both of adjustment and surface,

French marquetry, as practised by Buhl; and Riesner;

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and combining that with a very refined and quiet treatment of colour; his woods it is true are frequently stained, but never to such an extent as to mask the play of light on the fibres.

as described in the great Encyclopædia;

According to the description of the old French practice given by D'Alembert in the great Encyclopædia published in 1765, the wood forming the base of the marquetry was not cut out for the insertion of the ornament, until after the veneer had been glued down to the surface of the work. This enabled the ornament to be sawn out rather full, and then adjusted to a microscopic joint by filing down the edges. It was in this way, no doubt, that those extraordinarily fine lines, too thin for the passage of any saw, were obtained, which seem so astonishing in the joints of Riesner's finest work.

and as now practised in Paris.

The practice of marqueterie in Paris is now carried to great perfection, but is also very frequently abused. M. Brandely, a very clever artist, by whom most of the full-size drawings have been made, from which the greater part of the ornamented panels exhibited in the French portion of the Exposition have been carried out, habitually gives, to my taste, too loose a rein to his fancy. Instead of confining himself to forms somewhat conventionalized, and in as nearly as possible the natural tones of the various woods to be employed, he dashes away with a free palette, and aims at the production of pictures, which at best can be but "wooden" representations of nature in more ways than one. The processes of Dr. Boucherie for the injection of dyes into woods, denounced by M. Blanqui in 1849 as destroying their natural aspect, have presented a dangerous facility to the designer and workman.

French exhibitors—

M. Cremer;

M. Cremer, who unquestionably, for his excellent workmanship, and the scale upon which he conducts his operations, stands at the head of the "marqueteurs" of Paris, has fallen into this too seducing temptation; and one cannot but regret to see so much talent thrown away, in the production of patterns which rather detract from than enhance the value of the piece of furniture they are supposed to decorate. His work, I need scarcely say, is admirable.

M. Marcelin.

M. Marcelin distinguished himself so much in 1851, that I need hardly dwell upon the nature of his products. The microscopic exactitude with which his patterns, which are entirely of an elaborate geometrical nature, are set out, cut, and adjusted, is unique. M. Marcelin gave to the jury a most interesting account of the difficulties he had met and

vanquished, and it was truly delightful to hear the tribute of gratitude he offered for the services of his old foreman, Henri Scheyten, who had entered into all his struggles, and helped him to fight his way through to the perfection he has at last obtained.

Buhl.—Although both buhl and marquetry consist of inlaid veneers, they differ considerably in their methods of execution, which also affect the style of the ornaments thus executed; the former being confined to decorative scroll work, frequently in metal, while the latter is more commonly used for the representation of flowers and foliage. Buhl—

In buhl work, the patterns generally consist of continuous lines, of which the honeysuckle ornament may be taken as a familiar example. To make this, two pieces of veneer, of equal size, are scraped evenly on both sides with the toothing plane, and glued together with a piece of paper between them, for the convenience of their separation afterwards. Another piece of paper is glued on the outside, and on this the design is sketched; a minute hole is then made with a sharp pointed awl, for the introduction of the saw, a spot being selected in which the puncture will escape observation. The veneers being fitted in a frame, the saw is then inserted, and the several lines of the work are followed by the blade, which is kept horizontal, but the frame and work are rapidly twisted about at all angles, to place the saw in the direction of the several lines. Considerable art is required in designing and sawing these ornaments, so that the saw may continue to ramble uninterruptedly through the pattern. its design, and process of cutting out;

When the sawing is completed, the parts are laid flat on a table, and any removed pieces are replaced, and one of the veneers is stripped off with a palette-knife, which splits the paper. The pattern is now pushed out of the other veneer, and any minute pieces are picked out, and laid aside. The cavity thus produced is now entirely filled up with the pattern cut out of the other veneer, and the pieces are retained in contact with a little thick glue. They are then turned over, and the toothings, or fine dust of the darker wood, are rubbed in to fill up the interstices, after which the work is laid aside to dry. It is then ready to be glued on to the piece of furniture it is intended to decorate, in the manner of an ordinary veneer, and is subsequently scraped and polished. The two veneers which are cut out form the buhl and counter,* the one exhibiting, for instance, a dark its making up and varieties.

* The "partie" and "contrepartie" of the old French manufacture, of which the former is regarded by cognoscenti as much the most valuable.

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ornament on a light ground, and the other having the same pattern with the colours reversed. In the same way three thicknesses of wood may be sawn out together, and these, when cut through, split asunder, and recombined, would produce three veneers of buhl work. Such are technically known as works in three woods, and constitute the general limit of the thicknesses. The designs for such work should be as much as possible arranged to have a nearly equal amount of each colour, in order to make each of the combinations effective. In buhl work no part of the material is wasted, and this is one of the great differences between it and marquetry. Stamps or punches are sometimes used in buhl work of brass and wood, but only to a limited extent. All kinds of woods that are capable of being cut into delicate veneers, may be used in buhl work, according to the description just given, but the term was originally more particularly applied to a combination of brass with ebony or dark-coloured tortoiseshell. These were the materials which Boule himself almost exclusively employed, and he generally engraved the surface of the brass. Riesner used principally, as the ground, tulip wood (called in France Bois de rose) inlaid with flowers in dark wood, grouped in a less crowded manner than in ordinary marquetry.

Pearl buhl and "internal cutting."

When the material is in small pieces and costly, as pearl-shell, it becomes necessary to use several pieces, accurately placed edge to edge, to cover the entire surface to be ornamented. Sometimes in this material, in order to give additional elaboration and minuteness, the saw is made to follow all the outline of the counter, and thus leave only a narrow line of pearl; this is called internal cutting. But the effect of the counter is seldom equal to that of the true buhl, which shows the drawing of the ornament better, and the internal cutting of the pattern presents rather a thready appearance. The stringings, or fine lines of metal, which are introduced with pearl buhl, are generally of a white metal, such as tin or pewter. Such is the Parisian practice of the present day as given in substance by the late Mr. Holtzapfel, and confirmed by the inquiries I took occasion to make; and it is heartily to be desired that so graceful a process should be naturalized amongst us.

Revival of buhl work in France;

assisted by Blechschmidt.

For a long while after the death of Boule the art was in almost total abeyance, and it is only within the last thirty years that attempts have been made in Paris to revive it. The man who most contributed to that good end was a German of the name of Blechschmidt, whose pro-

ductions formed a leading feature in the cabinetmaking department of the Exposition of 1834. Being an exceedingly dexterous artist, he was much employed to make inlayings of ebony, ivory, mother-of-pearl, tortoiseshell, and different coloured coppers for the trade. Among the principal exhibitors of good buhl work in 1855 were, as far as I can venture to class them in order of merit, the following:—MM. Bellangé, Audot Verveille, Dagrin et Philippe, Krieger, Dexheimer, and Wassmus.

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Present practice by MM. Bellangé, Audot Verveille, and others;

M. Cremer, of whom I have already spoken in connexion with marquetry, exhibited a very ingenious application of "galvano-plastique" to the production of metal "plaques," resembling buhl in effect, but produced at one-tenth or one-twentieth of its price. He first causes a copperplate to be engraved with a conventional pattern; from this he takes a gutta-percha impression, on which he deposits copper, so as to obtain a fac-simile of his original copperplate. He then paints over the whole surface of the fac simile with a strong japan colour, in repeated and very thin washes. The copper is placed in a stove after each operation; when the colour has set hard, and has formed a thickness, as much beyond the plain surface of the copper as the excised parts are beneath it, the whole is rubbed down, until the plain surface of the copper is reached, and ultimately polished. The japan remains in the sunken parts, and forms a most agreeable contrast with the metallic surface of the copper. It may, of course, be done in any colours, so as to produce a good imitation of enamel instead of buhl, in which case the surface of the copper should be electro-gilt. M. Cremer is not only a man of great ingenuity, but of good taste as well.

and imitation by M. Cremer.

I now proceed to a consideration of *English Furniture*.

English furniture—.

Its prevailing forms in the present day, though less directly based upon historical style than the French, and dependent usually rather upon recent example and fashion, than upon a studious endeavour to emulate and surpass all that was good in the days of old, are yet modified to a considerable extent by such reminiscences; more especially in those exceptional cases which form the hinging points upon which improvement turns. Thus there can be no doubt that this groping after the light of the past revealed to that great man, whose loss the world as well as his friends must deplore, the late A. W. Pugin, those sensible principles of structure and ornament which, as applied to furniture, have given to some of our leading cabinetmakers,

its design in the present day based upon fashion rather than tradition;

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such as Mr. Crace, the power to revive the best characteristics of the middle ages, without demanding any servility in reproduction. Thus the studies of Gothic and Elizabethan forms made by Mr. I. K. Collings, the artist by whom most of the furniture exhibited by Messrs. Holland and Sons was designed, have led him to a recognition of the system upon which the mediæval designers gave order and symmetry to their direct imitation of natural foliage, by a due subordination to geometrical conditions; and thus the principal novelties and beauties of Messrs. Jackson and Graham's unique piece of furniture are based on the intimate knowledge possessed by its designer of the technical excellencies of the age of Louis XVI. Inaccurate study of the past leads only to Strawberry Hill Gothic and Ackermann furniture, but profound investigation of the past, coupled with a recognition of true principles, I am convinced, forms, in the present day, the best and only safe basis for ultimate originality. Hence, we should sincerely rejoice at the formation in this country of museums, such as that of Marlborough House, teaching the manufacturer and the artizan, better than a hundred lectures could do, the perfection to which production may be brought in every department of industry. Hence, we may estimate joyfully and thankfully, the high value of the lessons of experience conveyed to the cabinetmaker, by the superb collection of furniture of all ages brought together at Gore House.

importance of a return to the latter;

and consequent value of technical museums of the past, and antiquarian studies.

Influence of the "Renaissance" of Art upon furniture in England;

Before entering upon any consideration of what English furniture now is, we must, as a means of comparison, define briefly what its antecedents have been; not, indeed, going back to those mediæval days of which the tradition has died out, and to revive which we have now to transfer our sympathies altogether to other states of civilization, but rather commencing with the evidences of that partial revival of the antique which still constitutes the chief ingredient in our mental atmosphere. The era of the Reformation, in religion and in letters, was no less to us an era of revolution in Art, and it is from that point of change alone that modern fluctuations of taste can be dated. The renaissance of antique form, as understood by the cinquecento artists of Italy, and as translated to us by those great masters, Hans Holbein and Torrigiano, in the days of Henry VIII., spread rapidly throughout this country, and quickly pervaded every branch of decorative design. The models of half-romanized furniture which already abounded in Italy, Spain, France, and Germany, were ardently adopted by our court and aristocracy. The religious per-

under Henry VIII.;

secutions under Queen Mary doubtless dried up the sources from whence any foreign artists could obtain sufficient remuneration to make it worth their while to remain in this country, especially, they being for the most part Catholics, with the prospect of a Protestant succession. Accordingly in the reign of Queen Elizabeth we find abundant evidence, both external and internal, of English designers having to a great extent superseded foreigners. Queen Mary; Queen Elizabeth;

It may be well to convey in some slight detail the leading characteristics of this interesting period, in which classicality formed the substructure, and many a quaint device in cartouche and strap-work, interlacing ribbons, and half Gothic monstrosities, competed for supremacy in the superstructure, with the more graceful impressions of arabesque acquired by occasional intercourse with foreign nations. Characteristics of style during her reign;

Many specimens of the elaborately carved benches and tables of this period may be seen in some of the old halls attached to the colleges of Oxford and Cambridge, in which accommodation had to be provided for a large number of guests. The old arrangement of a large board and tressels still remained in use, Turkey carpets being employed to cover them, as well as those temporary buffets, then called the "court cupboards." The common cupboard or sideboard, which was made of oak, consisted of a large closet, with two smaller ones above it; an open space in front of these was supported on two or more fancifully ornamented pillars. The service of silver or pewter was displayed on a rich cloth placed on this shelf or space, during the dinner or supper, being at other times kept in the closets. in fitting up common halls and "withdrawing rooms."

The high-backed chairs of Queen Elizabeth's reign usually had their legs and rails turned, the flat spaces being ornamented with shallow surface carving; the seat and other parts were often covered with cloth of gold and silver, or rich embroidery. The tables were made and ornamented very much in the same way as the chairs, the legs being turned, in an exaggerated imitation of vases. in ordinary chairs and tables;

In bedrooms we often find two beds in the principal rooms, a standing bed for the master, and a truckle bed for his servant, the truckle bed being in the day time rolled under the larger one. We have a good example of the "standing" or four-post bed in the celebrated bed of Ware. The state beds from the time of Elizabeth to that of George III. are generally very high, the canopies ornamented with plumes of feathers, and the richness of the curtains and quilt forming their chief decoration. No doubt a good and unbroken series of these beds might be found in the various in bedrooms.

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seats of our nobility. The bedroom of this period contained, besides the bed, chairs, a dressing-table with embroidered covers, benches somewhat resembling our sofas, and a polished steel mirror in a black velvet frame, with a curtain to draw over it; chests were still used for holding clothes, which were also kept in wardrobes; then high pieces of furniture, filled with shelves, and often without further protection than a curtain in front. We are told, however, that Anne of Denmark possessed a chest of drawers.

Novelties introduced in the reigns of Charles II. and James II.

Many novelties were introduced, principally from France, in the reigns of Charles II. and James II., in whose time much of the furniture in great houses was gilt. In Granton House in Scotland are still preserved a sofa stool, and other articles of furniture carved and gilt, said to have belonged to the unfortunate Duke of Monmouth. The principal feature in the commoner furniture is the twisted legs and rails to the chairs and tables, the chair covers being cut up at their corners, and connected by frogs of gold lace. Cabinets, with glass fronts, for holding choice pieces of china, began to be imported in large numbers, and are still to be met with.

Improvements in style and work effected through Inigo Jones, Wren, Grinling Gibbons,

The studies by Inigo Jones of good Italian models exercised, after a while, a favourable influence over furniture, and paved the way for the genius of Sir Christopher Wren to direct into a wholesome channel the great ability of the celebrated Grinling Gibbons. Evelyn, ever foremost in recognizing true merit, introduced Gibbons to Wren, who immediately availed himself of the carver's rare talents, placing him at the head of the band of artist-workmen who were for the most part brought from abroad to work upon the decoration in stone and wood of St. Paul's and some of the other London churches. In 1714 Gibbons was appointed master carver in wood to George I., at a salary (probably by way of retaining fee) of 1*s.* 6*d.* per day. He was at the head not only of many Flemings, but of several English scholars, more particularly Selden and Watson, by whom not only many apartments and staircases, but much furniture of a handsome description, were enriched with good carving.

Selden and Watson.

"Rococo;"

The rococo style commenced about the latter end of Louis XIV.'s reign, and was at its height in that of his successor. This style became very prevalent in our furniture in the early part of the 18th century. Its general effect is sometimes agreeable, for, although the scroll-and-shell work is as devoid of meaning as the ornament of Elizabeth's time, it is frequently arranged in flowing lines, and is ornamented with buhl and marquetry. The chief novelties in the furniture of

this period are girandoles of cut glass, fauteuils, and japanned cabinets and screens; these latter were at first imported, but were very soon successfully imitated by our workmen.

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The designs in the publications of Gibbs and Kent give a tolerable idea of the ornament of the period as applicable to furniture; but it is in the works of French Mowatt and Thomas Chippendale that we find it best exemplified in practice. Both were men of remarkable executive ability, who fell upon somewhat unlucky days, when simplicity was not appreciated as an element of contrast, and when all, even to the periwigs of the existing mode, required to be twirled and curled into confusion. The best specimens of French Mowatt's work are the pulpit in St. Paul's and some of the chimney pieces at Windsor Castle; while the most favourable and complete illustrations of the powers of Chippendale are to be met with in the furniture of Cumberland Lodge, one of the minor royal residences near Windsor. He also published a series of designs in a somewhat angular Louis XV. style.

as designed by Gibbs and Kent, and executed by French Mowatt and Chippendale.

Mahogany was introduced by Dr. Gibbons, a physician, in the beginning of the eighteenth century, and shortly after most of the best furniture was made of this material.

Introduction of mahogany.

The furniture of the reigns of George II. and George III. claims but little attention as regards art, having become plain and meagre.

Furniture of the reigns of George II. and III.

Both Adelphi Adams and Sir William Chambers caused some little elegant furniture to be made, but the wiry style of the former and the heavy proportions adopted by the latter were not likely to exert any permanent influence on the trade.

The Adams's and Sir William Chambers.

Unquestionably much excellent work has been got up by some of the older firms, such as Seddons, Morant, Snell, Crace, Dowbiggin, Taprell & Hollands, Gillow, Bailey, and others, whose establishments have had the benefit of the artistic talent of men such as MM. Fossey, Beaugard, Depeux, Ash, Turner, Mulholland, Whittaker, Dwyer, &c.; but combinations, and other circumstances to which I shall presently allude, have during the last forty years barred the way to progress, so that neither manufacturers nor artists have been able to introduce any radical changes into the heavy and clumsy forms which have, until very recently, obtained universally. The dearth of energy in design, during the period above referred to, is singularly illustrated by the paucity of publications of tolerable pattern books. All that I have been able to meet with, issued since the year 1807, the date of Mr. Hope's and Moses' works, are beneath

Work produced by old English firms.

Comparative stagnation since the beginning of the present century.

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criticism, excepting those of Mr. Bridgens, published in 1838, and those of the late A. W. Pugin published in 1835. Mr. Henry Shaw's illustrations of old furniture were a valuable contribution to progress, but were somewhat too limited in aim and in art to produce much good fruit.

English furniture as represented at Paris.

A general survey of the English furniture exhibited at the Paris Exposition supplied materials for both congratulation and regret; congratulation on the progress evidenced by the houses of Jackson & Graham, Trollope, Holland,

Manifestations of progress;

and Levien, all of whom exhibited a great improvement upon their efforts in 1851; and regret for the evidence of a still lingering propensity to the sarcophagus style, in which the quantity of the wood, rather than the quality of its treatment, seems to be regarded as the test of merit. It would be unjust to deny to the English generally credit for the use of excellent materials, and perfect workmanship so far as it goes, but it must be observed at the same time, that it is only in quite exceptional cases that they emerge from a very limited range of woods, neglecting to a great extent variety and contrast of colour and texture in the different parts of a piece of furniture; almost entirely omitting to make use of ebony, ivory, tortoiseshell, bronze, brass fittings, mother-of-pearl, Indian, New Zealand, and Canadian woods, &c.; while their workmanship is for the most part confined to good joinery, gluing up, and mitering, smooth, plain veneering, and clean but not intricate turning.

and shortcomings;

All the more elaborate technical processes of, fine carving, incrusting in mosaic, marquetry, buhl, etched metal, and engraved ivory, uniting work carved in the solid with veneered facias, veneering on swept and circular-circular surfaces, applying chased and gilt brasswork, elaborate fret cutting, engine turning, and gadrooning, hard wood mouldings, &c. interrupted with plain faces, intersecting or dying on to one another at irregular angles, and many more varieties of cabinetmaker's work taxing skilled labour to the utmost, seem to be excluded almost in toto from the catalogue of English capabilities. This state of things points to

on the part of public, masters, and men.

a limited standard of appreciation of good work on the part of the English public, a set of masters without legitimate pride in the technicalities of their calling, and a body of workmen with their intellectual absorbed by their animal faculties; and when we consider how sadly unmindful we have been for the last three generations of national education, industrial and artistic, how can we wonder that such defects should make themselves apparent when we publicly enter the lists with other countries, whose more parental

governments have opened free schools for workmen, free public libraries, free museums, and other institutions open to artizans on days and at times when their habits and means enable them to avail themselves of the opportunities offered for self-improvement? Deprive the Parisian workman of access to the Louvre, the Hôtel Clugny, Sèvres, the Gobelins, Versailles, the Luxembourg, the Jardin des Plantes, the Ecoles Communales, &c., on his "Dimanche," and to expect him still to be an artist, would be madness. Shut up the Bau-schule, Museums, Industrie Gebaude, and public libraries of the German capitals, and away would go that interest in his craft which every German "bursch" now takes. If we would elevate the English workman we must recognize some other stimulant to his energies than beer; we must provide museums for him, where, as at Marlborough House, he may see what others have done before him, and better than him in his own trade: we must get some free libraries, where he may be able to go and improve himself; we must put some better and more ideal monuments than we already have into our public streets, spending more money upon their art, and less upon the quantity of materials of which they are made; we must, in short, educate his eye, and through his eye his mind, by giving him access to the best models of fine and industrial Art. Providing libraries to which access can be obtained during portions of the day only by payment, or by making previous formal application, and museums and galleries open from ten till four three days in the week, is a complete mockery to the artizan. If such places cannot be opened on a Sunday, either some arrangements must be made for lighting them up in the evenings, and opening them till dark in the summer, or we must be content with the very limited development of his manufacturing capabilities which now falls to the lot of the British workman.

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Necessity for governmental adoption of remedial measures.

It appears to me impossible to over-estimate, in an industrial point of view, the importance of the establishment of the Museum at Marlborough House, and it is my belief that much good might be done to the London artizans, at little or no cost to the Government, by opening it in the evening, well lit up, at 1*d.* a head, keeping in some of the rooms intelligent persons capable of occasionally explaining in simple language the principal objects exhibited, and answering such questions as to detail that might from time to time be addressed to them. The exhibition of furniture at Gore House was of great use, but rather to the masters and the public than the men. Could a similar exhibition be

Importance of the Marlborough House Museum, and of such exhibitions as that of furniture at Gore House.

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opened in the evening in a central situation, I believe it would be much frequented, and that we should very soon find, after they had seen what might be done in their own way of business, that there are very few processes of handicraft in which our working cabinetmakers could not very soon excel. At present they are generally almost entirely ignorant of anything beyond framing, dovetailing, veneering, scroll and claw-cutting, and French polishing.

Impediments to progress erected by the workmen as a body;

Impossible as it is to exonerate from responsibility those who should have assisted the workman to learn, it is but just to record how much harm their own combinations have done to their trade and themselves. It is not generally known, but I believe it nevertheless to be the fact, that on March 7th in the year 1811, the working cabinetmakers of London obtained by "force majeure" the consent of the masters to an arrangement which has remained as an absolute bar upon progress to the present time. Persons delegated by the trade met and catalogued every variety of work commonly practised at that time, affixing prices for piecework to every item, which prices have been maintained with no important revision up to the present time, entirely independently of supply or demand, and irrespective of fluctuations in the value of provisions, clothing, or rent. The whole system is embodied in a quarto work, called "The London Cabinetmaker's Union Book of Prices," published in 1824 by Stephen Couchman, of No. 10, Throgmorton Street. It was accompanied by some engravings of exceedingly ugly objects, which objects have of course been multiplied ad nauseam, since the adoption of the printed description, and the general form of the mouldings, &c. engraved, saved masters and men all trouble in drawing or thinking. The substitution of written specifications filled with cant terms for working drawings of course checked all design; and "the Book" contemplating only one class of work, the moment the master proposed a better he was at once met by demands on the part of the workmen to which he had no alternative but to submit. For peace and a quiet life he was forced to adopt the limited range of variety offered by "the Book;" and hence but for occasional competition with some bold spirits, who put themselves out of the pale of the union, and with importers of foreign goods, together with some little pressure from without, English furniture would have remained for ever in its dark ages. The wages contemplated in the list enable a workman only capable of making common goods to earn by working full time about 30*s.* a week; a first-rate plain workman can earn up to 40*s.*

through their retention of the "Union Book of Prices."

a week; and an artizan verging upon the artist can of course earn more, in proportion to his talent and facility in modelling or carving. The introduction of expanding tables produced an addendum to the first book in 1825, and in 1835 another supplement appeared, in which the term Buhl appears for the first time; the context, however, shows it to mean marquetry, in which two woods of different colours form the buhl and counter, instead of the brass and tortoiseshell of the original French work. The substitution of a system of "Prudhommes," that is, trustworthy representatives of masters and men, forming a tribunal of arbitration between employer and employed, would very quickly render the book unnecessary. A better division of labour would at once ensue; the men would be kept each one at the particular process of which he was the most thorough master; many more processes would be introduced; furniture would be made both better and cheaper, and there is no possible reason why, with improved mechanical appliances, we should not make cabinetwork a very much more important article of commerce than it now is amongst us. The public are beginning to look for better things; and, unless the men assist the masters in supplying such demands, they must expect to see the trade go from them, and foreign ornamental goods take the place of English. With such dangers ahead, it is indeed gratifying to see such work produced as some of the master cabinetmakers showed in 1855 in Paris. It is also most satisfactory to recognize how far the character of some of the best pieces of furniture in the British section of the Exhibition has been influenced by the teaching of the Government Schools of Art; and this more especially by the preparation of able and skilful workmen to execute those artistic portions of the manufacture for which we have been hitherto indebted to France. Had it not been for the assistance thus rendered, some of our best efforts would have been avowedly incomplete. Thus the skilfully executed plaques of porcelain in the cabinet and bookcase of Messrs. Jackson and Graham, painted with figures and amorini, were designed by French artists, and as it was not thought possible to have them successfully painted on the china in England, the slabs were sent to the Royal Manufactory at Sèvres. There, however, the artists were so overtaxed to prepare for their own display in the Great Exhibition, that, after keeping the slabs three months, they were at a late period returned untouched. In this dilemma, they were sent to Mr. Minton, of Stoke-upon-Trent, who had engaged four students, partly educated in the Art

A system of "Prudhommes" recommended as a substitute for the same.

Efforts made to overcome the limitations enacted by "the Book" system;

materially assisted through the teaching of the Government Schools of Art, in the cases of—Messrs. Jackson and Graham;

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Schools at the Potteries, and partly at Marlborough House, by one of whom, Mr. Grey, these plaques were painted in a style of excellence that leaves little room for regret that they were returned from Sèvres. The ebony cabinet designed by Professor Semper, and exhibited by Messrs. Holland and Sons, had for its centre panel and principal decoration a skilfully rendered repetition on china of the picture of "Crossing the Brook," by Mulready, from the Vernon Gallery, also by Mr. Grey, while the decorative panels surrounding the centre were painted by Mr. Morgan, another student in the same schools. Again, the carving of the bookcase exhibited by Messrs. Holland and Sons was superintended by Mr. Abercrombie, formerly of Somerset House; while the furniture of Messrs. Trollope, and the paper hangings of John Woollams and Co., were also indebted for much of their excellences to the teaching of the same schools; indeed, if it were not departing from the limits of the class included in this report, the influence of their training might be traced through almost every section of British manufacture in which art is combined with industry.

Messrs. Holland and Sons;

Messrs. Trollope, and others.

British exhibitors of furniture—

To proceed now to the most important English exhibitors of furniture, at the head of the list we meet with the name of Messrs. Jackson and Graham, who have worthily upheld the credit their house acquired at the old Crystal Palace, by manufacturing for the recent occasion a large cabinet, in the style of Louis XVI., good in composition and highly satisfactory in every detail of design; the only objection I have heard urged against it being that the frame of the glass which formed the upper portion of the piece of furniture was not quite so agreeable in form as the lower part.

Messrs. Jackson and Graham;

their cabinet the English masterpiece;

In order to afford some idea of the concentration of energy required to carry out such a work as this cabinet, for which the firm have received a gold medal of honour, I have obtained from them a complete list of those who have co-operated in its execution, and I feel sincere pleasure in giving this list, as it contains the names of those who have produced what I believe to be the first really noble piece of cabinetmaker's work, involving excellence in all the most difficult processes of the manufacture, which has been executed in this country. It is as follows:—

by whom carried out

Designer;

Designer:—

M. Eugene Prignot, who has now been principal designer to the firm for six years.

Modellers;

Modellers:—

M. Carrier, who modelled the caryatides.

M. Protat, who modelled the figures on the top of the glass frame, and some other portions.

M. Phenix, who modelled nearly the whole of the flowers and ornaments.

Cabinetmakers :—

Cabinetmakers;

Mr. Barnett, superintendent.

Thos. Benford and Thos. Usher, who were employed jointly in making the cabinet.

John Fletcher, who made the frame of the glass.

Carvers and Gilders :—

Carvers and gilders;

Mr. Morris, superintendent.

Claudio Colombo, who carved the figures modelled by M. Protat.

Robert Lock, John Doyle, James Fletcher, William Moore, Richard Blundell, Charles Mackenzie, Richard Moore, Thomas Wilson, William Laver, Thomas Barnham, and William Perry, who were all employed in carving the frame of the glass.

John Parr, William Ives, William Leslie, Francis Morris, William Day, John Leslie, Charles Hutchings, Hugh Jones, Thomas Landseer, Joseph Miller, Barney Holmes, John Collins, and William Day, jun., who were all employed in gilding the frame of the glass in a truly masterly style.

Metal Chasers :—

Metal chasers;

David Weston, Frederick Fowler, Claude Monsot, Richard Reynolds, David Gordon, all employed in chasing the figures, flowers, ornaments, and mouldings of the cabinet.

China painters;

The china plaques were painted by Mr. Grey, of Marlborough House, after designs by Messrs. Remon and Polish, and burnt at the establishment of Mr. Minton, of Stoke-upon-Trent.

Brass casters.

The brass castings were made by Messrs. Cope and Collinson, of Birmingham and London, and electro-gilt by Messrs. Elkington's process.

Advantage of concentration of foreign talents.

It is impossible to doubt, after seeing their work, that such a staff is equal to the production of any class of cabinet-maker's work, however difficult; and it is a subject for congratulation rather than for carping or regret that foreigners of such talent as is possessed by Messrs. Prignot, Carrier, Protat, Phenix, and Colombo should be at work amongst us.

Messrs. Jackson and Graham's establishment;

Messrs. Jackson and Graham's establishment has grown into importance as a manufactory within the last fifteen

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years through the great talents of Mr. Peter Graham; it comprises the various branches of cabinet and chair making, carving, gilding, upholstery, and interior decoration, all organized and carried on in one range of buildings at the rear of the warerooms in Oxford Street. A steam engine, and machinery for various purposes connected with cabinet-making, have recently been erected and put into operation, by which means a considerable saving is effected in production, without any diminution of wages.

and number of workmen.

The number of persons employed in the various departments of the manufactory, including females, averages about 250, and the weekly wages amount to about 400*l.* per week.

Messrs. Trollope.

Next in satisfactory design and execution, though in a less ambitious form unquestionably, came the goods exhibited by Messrs. Trollope, whose enterprise was rewarded by a silver medal. Their display consisted of a bookcase and of a bedstead, both treated in a somewhat similar style to the admirable bedroom furniture contributed by the firm to the Great Exhibition of 1851. In the design of the bookcase, however, a very considerable advance was manifested, and greater refinement was attained, more especially in the carving, which was arranged by Mr. R. Beavis, late a student, of Marlborough House. In carrying the design into execution, I believe considerable assistance was rendered by Mr. Bird of Wardour Street. Messrs. Trollope's firm was established in the year 1788, and they have been extensively employed as decorators and upholsterers under most of the eminent architects of the last fifty years. One of their principal carvers is Mr. Jefferys, and the name of their principal worker in marquetry is Vandenbrand, whose patience, perseverance, and skill they warmly acknowledge. It is indeed only just to draw attention to the excellence of the work of this last named artist-workman. The whole exhibition contained no specimen of marquetry composed of unstained woods of equal excellence, either in arrangement or detail of execution.

Mr. J. G. Crace.

It is to be regretted that a severe illness prevented Mr. J. G. Crace from making those exertions which would otherwise probably have led to his being better represented than he was by a side-board, which, though both cleverly designed and carried out in the well-known manner of the late A. W. Pugin, was not of a sufficiently high character to merit more than a bronze medal. It was not very easy to impress a jury of foreigners with the importance of what appeared to me to be the merits of this piece of furniture. That free, crisp way of working, that shows every stroke of the gouge or chisel,

indispensable, as I believe, to a successful imitation of mediæval work, and to obtaining a good deal of effect at moderate cost, was looked upon as rather coarse and clumsy; the general effect, however, was duly appreciated.

Although Mr. Crace has only added this style of cabinet-maker's work to his business within the last few years, his house is of old and high standing, since, when the Prince of Wales commanded the extensive decorations at Carlton House to be carried out under the direction of Mr. Holland, Mr. Crace's grandfather was entrusted with the conduct of the works; he also executed with great success the decorations at Lord Willoughby's in Piccadilly, the old Pantheon, the Marquess of Abercorn's at Stanmore, and many other mansions and theatres. Numerous important decorative works were executed by Mr. Crace's father at Windsor Castle, Brighton, Carlton House, &c., under the superintendence of Sir Jeffrey Wyatville, Sir John Soane, Mr. Nash, and other celebrated architects. That Mr. John Gregory Crace has successfully studied the history and practice of his art is proved by his contributions to the transactions of the scientific societies of London, as well as by the works which he has carried out, some of the principal of which, in the Italian style, have been executed for the Duke of Devonshire, at Devonshire House, Chatsworth, and Lismore Castle; and for the Marquis of Breadalbane, at Taymouth Castle; his connexion with Sir Charles Barry and the late Mr. Pugin at the Houses of Parliament proves his competency for the successful treatment of mediæval art.

Messrs. Holland and Sons;

The library furniture exhibited by Messrs. Holland and Sons, of 23 Mount Street, Grosvenor Square, London, and for which they have received a bronze medal, consisted of a bookcase, a pedestal table, and two chairs. They were admirably executed in wainscot oak, portions being inlaid with pollard English oak, malachite, and Irish marble. The style adopted by the designer, Mr. J. K. Collings, well known for his works upon and knowledge of Gothic ornament, was the renaissance, but without the strap and cartouche work, or any admixture of the grotesque by the introduction of animal forms among the decorations. The object sought was to produce a handsome but unobtrusive character, with novelty in the ornamentation. The carving is, therefore, all designed and rendered in a purely conventional manner from nature, without being in any way copied from previous decoration of any kind. The natural objects thus rendered are the oak, the ivy, the hawthorn, the maple, the hop, the holly, the thistle, and the passion flower, besides

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the national emblems, the rose, shamrock, and thistle. The furniture exhibited was intended to represent a portion only of a complete suite, available for a library in a gentleman's mansion, since, by a simple repetition of the number of the divisions, the bookcase might be adapted with ease to the fitting up of a complete library.

their library furniture, how appreciated by the jury

The claims to consideration of Messrs. Hollands and Sons could scarcely be expected to be fully appreciated by the foreign elements in the jury, who were, of course, sensitive to some few defects in design and treatment, without being enabled to appreciate at their full value the efforts made by the firm to elevate the character of English design and workmanship, at a moment when such efforts are of the highest national importance. The proportions of the columns were by some objected to as being too thin, the enrichments upon them too strong and common for the style, and the mouldings generally wanting in delicacy of proportion and contour; by others the ornament was considered to be too much treated upon one plane, and therefore agreeing rather with a Gothic ordonnance than with the renaissance features adopted, while to all it was a matter of regret that the woodwork was not stained or polished in some way, so as to bring out the grain of the wood, and to cause the incrustations to harmonize with the plain and carved parts. The work was by all admitted to be excellent, and the design of the ornament was allowed to be original and well spaced out; but there were so many pieces of furniture involving greater difficulties of successful execution in the French department, and greater merits of design, to which it was only possible to give bronze medals, that it was not feasible to obtain for Messrs. Holland and Sons that higher distinction to which Englishmen may consider their honourable and patriotic enterprise had entitled them.

their ebony cabinet;

Their most successful production certainly was an ebony cabinet, designed at Marlborough House by Professor Semper, exhibiting the progress of painting on china by the pupils of that school. It was made in the short space of three weeks, and was very elegantly treated. The chief defect was one for which Messrs. Holland and Sons were not responsible, namely, that the principal plate of porcelain, which was beautifully painted by Mr. Grey, of Marlborough House, was too large for the style of the piece of furniture, the upper part of which was again somewhat too ponderous for its rather spidery legs. As a specimen of workmanship in a difficult material, ebony, to the merits of which we have hitherto shown ourselves almost to-

tally indifferent, it was worthy of high commendation. Messrs. Holland and Son's workshops are among the best mounted in London, exhibiting all recent improvements as to processes of manufacture. They are now introducing machinery to a large extent, as well as peculiar implements and tools. In this respect, as well as in the ability of the artizans in making use of them, we are alleged to be in advance of the French. Messrs. Holland and Son's workshops are so excellent, and so well arranged with every known appliance for good and cheap production, that the great cabinetmaker, Jeanselme, of Paris, continually and voluntarily refers to the fact that he took his ideas and models from their establishment. Messrs. Holland and Sons have been so good as to furnish me with a statement, in which there is, I believe, the greatest possible truth, however unpalatable it may be to believe so. "Free trade," say they, "has done much in showing how ridiculous were the fears that we should be undersold; our customers, however, —and you are aware our connexion is among the most noble —and wealthy, continually drive at cheap articles, except some few important articles for the dining-room, library, and drawing-room, and require as much teaching as the present race of draughtsmen or designers." They further remark, in reply to my inquiries, that they consider that the principal impediments to the progress of the manufacture of elegant cabinetmaker's work in this country, are caused by a great want of designers, draughtsmen, and modellers; in fact, of all the directors of art. The very few who can assist demand and are paid such excessive rates, that their services are dispensed with, except upon important occasions.

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their workshops;

their remarks on the economic tendency of the age.

The jury placed upon the same level with Messrs. Crace and Holland Mr. J. M. Levien, whose table in marquetry of natural (*i.e.* unstained) woods was much admired for the judicious selection of the colours, and the neatness of the workmanship. This style of geometrical marquetry, which has been carried to the highest pitch of excellence it has ever yet attained by M. Marcelin, of Paris, occupies a position midway between Tunbridge ware work and artistic marquetry. It is made by gluing together pieces of wood so as to make up a mosaic pattern of some thickness; it is then trimmed to a very precise set of angles, so as to make up a repeat in a pattern with great nicety; the block of mosaic is then cut into as many thicknesses as the repeat requires to be reproduced to make up the entire pattern; and each veneer is glued down into its place. Thus one operation of making

Mr. J. M. Levien.

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up the mosaic produces the effect of an elaborate incrustation. It is a process, however, that can only be successfully carried out by a good workman and thorough practical geometrician. By cutting his original mosaic in various oblique directions, regluing up the pieces, and recutting at different angles, Mr. Marcelin rings an indefinite number of changes upon his first setting out, and is thereby enabled to produce a great variety at moderate cost: and we do not doubt that ere long Mr. Levien will successfully emulate his ingenuity.

The furniture contributed by the rest of the English exhibitors, although generally creditable, offered no very salient features for observation. Messrs. Gillows' writing table was considered to be well made, and of handsome materials, but was thought heavy in style and treatment. Messrs. Morant and Boyd's chairs were deemed elegant. Mr. Fry's bookcase was awarded an honourable mention, and Mr. Smee's furniture considered to be strong and soundly made, but inelegant. Messrs. Banting's work was of a good straightforward character. Mr. Caldecott's lampstand was considered to be well finished, more especially in the inlaying at its foot.

Messrs. Gillow.
Messrs. Morant and Boyd.
Mr. Fry.
Mr. Smee.
Messrs. Banting.
Mr. Caldecott.

English marquetry

Marquetry in a rude form was practised in England as early as the reigns of Elizabeth and James I., but we probably owe most of the curious articles of furniture now and then met with in houses of the time of Anne, and of George I. and George II., to foreign workmen, from whose introduction much advantage was derived.

as described in 1788;

Chambers' Cyclopædia of Arts and Sciences, published in the year 1788, contains a clear description of the processes, both of marquetry and boule, which he states to be used "amongst us" by cabinetmakers, joiners, and toymen. There were among them and probably are now amongst us at least three modes in common use for darkening the colour of certain portions of the woods employed, so as to form shades:—

processes for shading woods;

1st, dipping them in heated sand;
2nd, applying lime water and corrosive sublimate;
3rd, steeping the parts in oil of sulphur.

hot sand recommended;

Of these the heated-sand process is considered to be the best, as least injurious to the texture and surface of the wood.

English recent revival;

The art has been revived in modern times, but both English and foreign specimens have in general failed in design and execution; the artificially produced colours have

not been harmoniously applied, nor have they proved durable, while the smoothness of surface, which is so necessary, is often impaired by the unequal thickness of the veneers employed.

unsuccessful when attempted with highly-stained woods;

Of late years a process was introduced which produced very cheap but very unsatisfactory marquetry work. The whole of the patterns were cut out of white wood and fitted together; they were then stained in the requisite colours, and glued together. The consequence was either that the colour was superficial or fugitive, or that if it had thoroughly imbued the wood it had destroyed its beautiful silky fibre.

excellent as practised by Messrs. Trollope.

I have already spoken of the excellence of Messrs. Trollope's marquetry, entirely executed in natural woods, and I am happy to be able to subjoin some few particulars on the subject with which they have favoured me. They observe that "in the choice of woods for marquetry the greatest judgment and experience are required to select such as shall be permanent in colour, and such parts of them as shall produce the desired effect; moreover, much depends upon the direction in which the veneers are cut. About twenty different kinds of wood, producing a great variety of effects, according to the parts selected and the mode of cutting, were employed in the articles exhibited by that firm. Among these may be named holly, camwood, red sanders, tulip, sandal, and purple woods, ebony, Barbary wood, Russian maple, lignum vitæ, mulberry, kingwood, amboyna, walnut, porcupine wood, &c."

Furniture of other nations—

The furniture of the remaining nations may be rapidly disposed of, as it was only in exceptional cases that they presented features of interest.

India;

India contributed sofas, tables, and flower-stands, admirably carved in the black wood (*Dalbergia latifolia*) of Bombay. These objects were much admired, and studied by the best French designers; and the merits of the native workmen, Manackkye Nowroje, Rustonjee Nowji, and Achima Purboo, were acknowledged by the award of bronze medals. Ivory chairs, tables, and footstools were also exhibited, of great beauty; and Lallah Persod was given a bronze medal for their execution. The design and elegant geometrical arrangement of the patterns carved in sandal-wood were also duly appreciated.

America;

America showed to great disadvantage; her only representative of any importance being M. Ringuet Leprince, who has left Paris to set up in business in New York. Judging by the style of the piece of furniture he exhibited, he has not gained by the removal.

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Canada; *Canada* received warm commendation for good manufacture and moderation in price. Some chairs covered with the skin of the moose deer, worked over with patterns in porcupine quill, were much admired; while the collection of woods available for cabinetmaker's work was placed upon an almost equal rank in importance with those of Algiers, India, and Australia.

Austria; *Austria* was best represented by M. Rosani, of Brescia, who showed the most elaborate specimen of minute marquetry in good taste in the whole Exhibition; and M. Thonet, of Vienna, in the Gumpendorf Strasse, whose chairs and tables made of bent wood united the important requisites of elegance, simplicity, lightness, strength, and cheapness in an eminent degree. Röhrs, of Prague, showed some good work in an overloaded style.

The Papal States; *The Papal States* took the place which Tuscany held in 1851, and entirely through the remarkable taste and skill of Signor Gatti, of Rome, who sent a small escritoire of extreme originality and beauty. Simple but graceful in form, it was covered over with incrustations in marquetry of woods, ivories, and precious materials, engraved all over with most spirited arabesque, after the best cinquecento manner. It was awarded a silver medal unanimously.

Belgium; *Belgium* competed successfully with Switzerland and France in the fabrication of parquet floors, two of her exhibitors, Messrs. Dekeyn and Godefroy, showing much taste and dexterity in the arrangement of the various woods; the prices also seemed to be reduced to an extraordinarily low rate. The latter of these two exhibitors showed some good furniture, and a very clever arrangement for fastening a pair of folding-doors by one turn of the door-handle shooting the top and bottom bolts, as well as locking the two flaps together.

Hamburgh; *Hamburgh*, among the Hanse Towns, took a prominent place, through the excellent quality of the goods exhibited by the firm of Werner and Pighlheim, who manufacture largely for exportation. Good sober taste, excellent materials, and sound workmanship procured for the house the award of a silver medal, which would have been given but for the fact of M. Pighlheim being a member of the jury. It is but just here to record the fact of the great value the jury set upon the opinion of M. Pighlheim in technical matters, and the approbation he received from all for the unquestionable honesty, frankness, and impartiality with which he gave the jury the benefit of his knowledge and experience.

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The remaining nations maintained their respective industrial positions creditably, but their furniture offered no very salient features for remark, saving that generally Germany and Holland showed the neatest and truest work, Tuscany the best carving, and Sardinia the best marquetry.

Germany, Holland, Tuscany, and Sardinia.

SECTION II.—*Furniture in Metal*—

Furniture in metal—

Was divided into three principal elements,—stoves and grates, iron bedsteads and chairs, and articles made up of wire-work. England was the only country whose stoves merited especial notice, and among her exhibitors the following were most conspicuous:—

Stoves and grates.

Mr. H. E. Hoole, of the Green Lane Works, Sheffield, maintained the reputation he acquired in 1851. Thanks to the genius of Mr. Alfred Stevens, this branch of trade has been developed to such an extent as to have obtained the suffrages of all nations, and to have won for the house of Hoole the distinguished reward of a gold medal of honour. The leading characteristic of Mr. Hoole's exhibition was excellence rather than great novelty. What especially gratified the French connoisseurs was to observe that good taste presided equally over the designs for the cheapest and for the most expensive goods produced by the house.

Mr. H. E. Hoole.

Messrs. Feetham's productions were good both in arrangement and execution.

Messrs. Feetham.

Mr. Pierce was also commended.

Mr. Pierce.

Metal bedsteads and chairs;

In metal bedsteads (especially brass) and chairs it is to be regretted that England did not compete, since I believe, if she had, she would have carried away the best prizes.

France alone showed extensively, and, at the same time, creditably. The manufacture is one of no great antiquity, since the first appearance in public in France of iron furniture dates only from the Exposition of 1806, in which a M. Henri exhibited beds, which he described as suitable for travellers, and for use on board ship. It was not, however, till about the year 1826 that they were extensively patronized by the French Government, who gave an order to Pichet Frères for 30,000, for the use of the War Department, in that year. In 1834 the manufacturers supplied 60,000 for the use of the French and Algerian garrisons. The application of the tubular system to iron furniture was first made in the same country by MM. Gandillot Frères and Roy of Paris.

when introduced in France.

French exhibitors.

The best French exhibitors were Messrs. Leonard, Dupont, Brag, and Huret. There were some novelties in folding spring mattresses, but none of any great importance.

Prussian ornamental zinc work.

Among the articles made up in zinc and wirework, the best of the former were the Prussian exhibitor's, Pöls, of Elberfeld, whose flower-stands, in a late Moorish style, were both novel and pleasing.

French wire work.

The French appeared to be the most tasteful wireworkers, and M. Clairin, Tronchon, and Tessier showed some elegant fancy in their aviaries and garden furniture.

SECTION III.—*Furniture in Stone and Marble—*

Furniture in stone and marble—

Was well represented in every department. It involved four principal considerations, those of the raw materials, the work produced in natural substances, the plastic imitations of them, and the processes of Roman and of Florentine mosaic, the details of which latter, both historically and technically, are so inaccurately known that I have collected all the notices I could concerning them.

French;

First in importance of natural marbles and stones came those which France was enabled to bring into the market. Algeria and Corsica, the French Pyrenees, and some other districts offered invaluable materials for decoration; and on all hands evidence was produced of skilful means and appliances for working the quarries, and sawing, polishing, &c. the slabs and blocks. I have under my hand the trade-list of MM. Dervillé et C^ie^, one of the principal and most intelligent of the Parisian marble merchants, and from it I find that there are 120 different varieties of marbles constantly in the market, the produce of the quarries of France alone. If to these be added the noble agates, and specimens of rosso and verde antico forwarded from Algiers, and the splendid green marbles of Corsica, which can be obtained in grand dimensions, it must be confessed that the position of France, in relation to this branch of supply, was magnificently vindicated.

English;

Granite,

and serpentine

To contrast with such richness we had no very great variety of natural substances to offer; beyond our well-known granites, the art of working in which was well exemplified by Mr. M'Donald, we could produce little excepting our admirable "serpentine." This beautiful stone, which is quarried at the Lizard, near Penzance, Cornwall, is an "igneous rock, varying greatly in general appearance, texture, and colour, in which latter it is very similar to the blood-stone, but richer." It is hard, capable of high polish, and of being wrought into designs requiring the most minute carving, without diminishing the effect of its tints, and has the advantage over marble in not being susceptible of injury from grease, acids, or atmospheric influences.

The serpentine, as met with at the Lizard and other places, is found to be— its analysis as met with at the Lizard, Cornwall;

Silica . . .	43·93
Magnesia . . .	28·00
Iron and chromium . .	13·26
Manganese . . .	·35
Lime	2·60
Alumina . . .	1·28
Water	12·42

Serpentine has been in use and exposed for nearly a century and a half, without the least injury to the polish, internally, in the brackets of two monuments in Westminster Abbey, and also in the panel bordering of the monument erected to the memory of the Earl of Halifax, adjacent to one of his friend and protégé Addison, in the north aisle of Henry the Seventh's chapel; and externally, in the Church of Landewednach, near the Lizard, Cornwall, which is built of granite, with quoins of serpentine, the former being in a very decomposed condition, while the arrises of the latter are quite perfect. its durability;

The Company by which the material is now brought into the market, are prepared to execute works to any extent, and with promptness, by complete and powerful steam machinery; and also to supply the stone, in all reasonable lengths, in blocks or slabs; and they have also opened extensive show-rooms in London. its supply;

Mr. Robert Hunt tells us that the quarries have during the last twelve months been opened by powerful Derrick cranes to a depth of from forty to fifty feet, and the superincumbent mass of loose and unsound stone having been thrown over the cliffs, the Company have come upon extensive beds of consolidated rock, which are worked in the same manner as quarries of granite. The size of the blocks raised formerly varied from two to ten feet; but the masses have increased to so great an extent with the depth, that it is now frequently found necessary to break the blocks up before they can be removed. In proof of the greater consolidation of the material, we are assured that this process of division is accomplished by "splitting and tearing," in the same manner as in the case of granite; and there is now no difficulty in obtaining sound blocks of nine, ten, or twelve feet in length. its attainable dimensions;

The prevailing shades are red, black, green, white, and yellow, blended in endless combinations and varieties, and mingled with sparkling crystals of diallage. The red, its colour.

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unlike any similar shade found in other stone, is bright and blood-like, sometimes giving the effect of a gem, and in all cases imparting a warmth of tone which cannot be obtained in any species of marble.

Slate.

There is one other substance peculiarly national, which, although sufficiently humble in its usual aspect, has been so skilfully treated by an enterprising individual, that it has been raised by his ingenuity, from the rank of homely substances, into one possessing great claims to general admiration. I allude to slate; and it is gratifying to think that there was scarcely any other set of objects exhibited in Class XXIV. which obtained more unfeigned admiration from foreigners than did Magnus' preparation of this material, the dexterous and tasteful application of which to a hundred useful purposes, although shown in 1851, came as a complete novelty to the majority of visitors to the Exposition. I am happy in being able to offer a few interesting particulars concerning the origin of the manufacture.

account of Mr. Magnus' treatment of that material;

About the year 1838, having an interest in some slate quarries in Wales, Mr. Magnus' attention became strongly attracted to the applicability of slate to a variety of new purposes, its chief uses at that period being limited to the covering of houses, flooring, cisterns, and writing tablets (school slates). Struck with its smooth satin-like surface, its remarkable strength, its non-absorbent texture, the ease with which it could be chiselled, planed, and turned in the lathe, and the large sizes of the slabs, he felt assured that it might be made an object of far greater value if there could be imparted to it a more cheerful aspect. In vain he endeavoured to give it a natural polish, the utmost he could impart was a soft appearance like ebony. Having resided many years in the Staffordshire Potteries, and being familiar with the processes of glazing and enamelling china and earthenware, he next sought to treat slate in a similar manner. After repeated trials, with Wedgwood's pyrometer, of the various degrees of heat to which slate from different quarries could be coaxed, by very gradual heatings, he succeeded in getting a coating for it that would bear a very considerable heat (500 degrees of Fahrenheit), and a polish superior to that of marble, equally or more durable when exposed to the open air, and permanent probably for a century or more when under cover. This was patented in 1839, but as improvements were daily making in the treatment of the material, Mr. Magnus did not deem it advisable to take out a series of patents, and thus his invention of

floating mineral colours on prepared water (by which process a single individual can marble twenty chimney-pieces in one morning, more true to nature than any grainer could a single slab in the same time) was left open to be copied. As was expected, this process has been not only copied, but badly copied, by some of his discharged workmen, to the detriment of Mr. Magnus' reputation and pecuniary interests. A notable instance of unsuccessful copying was to be seen in the American department, characterized by a dingy black and dull polish. In some interesting particulars with which he has favoured me, Mr. Magnus says, "Though not brought up to any business or profession, I had in my youth studied drawing *con amore*, under Cardelli, fellow-pupil of Canova, a sculptor of great talent and an excellent draughtsman. I was thus competent to direct and form artists, and I believe those in my employ would do credit to any establishment, whether Continental or British, although my principal designer, when I took him into my employ, was a plasterer, my chief grainer a baker, and my best imitator of Florentine mosaics a poor boy, one of four ragged urchins that an old Irishwoman had besought me to put to any kind of work.

as recorded by himself.

"The chief impediments I had to contend with were the timidity with which architects adopted a new and untried production, and the jealousy of trades. The stonemason lost part of his trade in chimney-pieces; the marble mason saw with dismay the probability of enamelled slate superseding foreign marbles; the plumber found slate cisterns and flats take the place of lead; the plasterer and scagliola-man saw columns, pilasters, and plinths of slate, and halls and vestibules lined with a more permanent and brilliant material than his own; the painter saw his best graining outshone; all were interested in decrying the invention; architects, builders, and the public generally were assured that enamelled slate would not stand the heat requisite for chimney-pieces, that it would chip, blister, and lose its polish; whereas, after fifteen years' trial, it is found that if marble were put into the chambers where the slate is enamelled it would become calcined, that slate does not chip nearly so readily as marble, that it does not blister, and that its polish will remain even when it is placed in damp apartments, where every atom of polish would go from marble. In 1848 I received the medal from the Society of Arts, in 1851 the prize medal of the Great Exhibition, and at the Paris Exhibition of the present year I believe I am the only exhibitor who has been

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honoured with two first-class medals, one under Class XII. for civil architecture, and one under Class XXIV. for decorative art. The following are some of the purposes to which enamelled slate is now made applicable :—Chimney-pieces, plain and of the most elaborate costliness, stove-fronts, moveable cabinet and pedestal stoves, pilasters, plinths, columns, linings for halls, vestibules, dairies, &c. baths, baptisteries, altar tablets, vases, pedestals and brackets, ornamental slabs for loo tables, consoles, and cheffoniers, wash-stand tops, billiard tables, and a variety of useful and ornamental articles too numerous to be separately specified. It is becoming sought after abroad. Enamelled slate for the baths and wash-houses at *Berlin* has just been furnished by me. At the Paris Exhibition Prince Napoleon and Count de Mornay were among the purchasers, besides numerous distinguished personages from various parts of the Continent and from America. Shippers to Australia and other distant parts are beginning to discover that enamelled slate, besides being cheaper than marble, is not liable to lose its polish by a sea voyage ; and that the risk, nay, almost certainty, of breakage that attends the transport of marble, amounts to nothing on slate, it being ten times as strong as marble in general."

Purposes to which enamelled slate may be applied.

Merits of Mr. Magnus.

When we estimate justly the merit Mr. Magnus deserves for taking a rude and imperfectly appreciated material, for giving to it form and ornamentation, for raising a school of artists, and for applying it to hundreds of new purposes for which it could be better and more cheaply adapted than those which it displaces, as is proved by the daily increasing demand for it, we cannot but feel that he has deserved the highest honours which could be awarded him. The appearance of his products in 1851 doubtless alone prevented his receiving that reward which, had they been an entire novelty on their late appearance in Paris, there is very little doubt the International Jury would have awarded for his admirable set of specimens.

Northern Italy and Belgium.

Both *Northern Italy* and *Belgium* contributed well carved specimens of marble work, but in no case rising above the ordinary level. It was much to be regretted that the Milanese districts, and those of Carrara, appeared to be altogether losing the traditions of good design. There was indeed a fine specimen of carving in a monster marble four-fronted looking-glass and lavatory, designed by an Italian professor, Signor Isola, of Massa, but so sadly mistaken in treatment as to take it out of the power of the jury to reward the infinite labour it manifested.

Tuscany forwarded some good pratolino and lumachella well worked, but not in all cases tastefully. Tuscany.

Rome sent, through Signor Gallandt, some noble specimens of very rare marbles, in vases of graceful shapes and perfect execution. The largest was cut out of a magnificent block of giallo antico, and the smaller of a very rare spotted marble, of which some leopards, which are preserved in the Sala degli Animali of the Vatican, are (so far as I know) the only large specimens extant. Rome.

Turkey forwarded some superb slabs and blocks of oriental alabaster, but her other specimens of minerals, as well as those of Spain and Portugal, were rather for the mineralogical cabinet than for an industrial exhibition. Turkey.

Sweden maintained the reputation she acquired in 1851, for working the hardest possible materials, jaspers, porphyries, and granites, in high perfection; and for their rare beauty the jury awarded a silver medal to the Royal Establishment. Sweden.

In 1851 the world of artists were led to hope that the quarries, both of the Isle of Paros, and of Pentelicon, would be reworked upon an extensive scale, and that the celebrated materials of those districts would again be supplied to sculptors, at rates even below those at which the statuary marbles of Carrara and Serravezza can now be obtained. This hope has hitherto been frustrated, and the Exhibition of 1856 gives no sign of life in those quarters. We missed, too, from among the specimens any of the celebrated "flesh-coloured lychnites" of the ancients, a material which is of peculiar interest to those sculptors who desire to heighten their treatment of form by the introduction of colour. We met, however, in the Greek department, with many indications that the sources are yet accessible, from whence the classic nations drew many of their most valuable materials for decorative purposes. Damaristica and Cynopolis still furnish "rosso antico;" agate-breccia still comes to us from Xilokeratia, porphyrite from Crocæa, cipollino from Pyrgari in Lageia, breccia from the Taygetus, the amygdaloidal marble of Parori (Sparta), marbles and breccias from Nauplia, the red marbles of Cape Tænarus, the green marbles of Tænus, the black marbles of Laconia and Mantineia, and alabastroidal marble (of which antique lachrymatories it is said were made) from the island of Psythalia (Piræus). Greece.

Of plastic materials, imitating natural substances, little can be said, since the varieties of scagliolas were but indifferent, failing both in colour and polish. The best worked were Scagliola.

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those of Crapoix, of Paris, whose inlaying was much better than his imitation. I proceed, therefore, to the interesting subject of Roman mosaic.

Roman mosaic;

The revival of classical study and learning in Italy naturally directed attention to ancient art and manufactures; both Rome and Florence successfully laboured to restore the old processes of mosaic, the former imitating the opus figlinum, now known as modern Roman, and the latter the opus sectile, known at present under the name of modern Florentine mosaic.

revived under Clement VIII.;

When Clement VIII. undertook the decoration of the domes of St. Peter's at the beginning of the 17th century, the demand for workers in mosaic in Rome was very great, and, in consequence, the school and manufactory were established which are now known as the "Fabrica." When these works were commenced, the artificers received as much as four scudi for forming one square palm of coarse mosaic, but Ciampini tells us, that in consequence of the great number of artists who were attracted to Rome from all parts of Italy, "fama tam immodici pretii, et copiæ musivi operis quod inibi construi cœperat," the price soon fell to about half a scudo for a similar quantity of work. The ability and genius of Giovanni Baptista Callandra, and the occasional discoveries of ancient examples, no doubt greatly stimulated the study of the art in the great Papal manufactory at Rome.

improved by Callandra;

Callandra, who died in 1644, greatly improved the practice by his invention of a retarding mastic cement for fixing the tesseræ. The well-known copy of Guido's picture of St. Michael the Archangel, which adorns one of the chapels of St. Peter's, was executed by him.

present processes for work upon a large scale;

Scarcely any change appears to have been made in the mode of manufacturing mosaic from the time of Callandra to our own. The process now usually adopted at Rome is as follows:—A metal plate of the required size is surrounded by a margin of about three quarters of an inch in height; it is then covered for about a quarter of an inch in thickness with a mastic cement, composed of powdered Travertine stone, lime, and linseed oil: when set, this is covered to the level of the margin with plaster of Paris, on which is carefully traced the outline of the picture intended to be copied; from time to time portions of the plaster are removed with a fine chisel, to allow the insertion of the small pieces of *smalto*. The "smalto" is composed of glass, and full directions are given in the works of Ciampini and of Neri for making and colouring this substance. It is prepared in circular forms, about half an inch thick, and

about six or eight inches in diameter. Nearly ten thousand varieties of colour are kept in readiness in the stores of the Papal "Fabrica," and from them the artist selects a piece of the required tint, which he brings into the shape he needs by placing the smalto upon a sharp metal edge and striking it with a hammer of similar form; the smalto is thus broken as far as possible into the form desired, and it is afterwards ground with emery powder upon a lead wheel, until the precise size and form are obtained. The piece is then bedded in its proper position, having first been moistened with a little cement, and the process is repeated till the whole picture is finished, when it is ground down to an even face, and polished. In this manner have been formed the noble specimens of mosaic which decorate the altars of St. Peter's, such as the Transfiguration of Raphael, Guercino's Sta. Petronilla, and Domenichino's St. Jerome. There are now usually six regularly instructed artists employed at the Vatican in the "Fabrica." The manufacture of the minute mosaics, so much employed at the present time in articles of *vertu* and *bijouterie*, is carried on in most respects in the same manner as that of the coarser mosaics, though obviously upon a very minute scale. The principal difference is the introduction of the blow-pipe for reducing the dimensions of the strips of smalto, which are made into little sticks or rods, thereby doing away with the necessity for breaking it into form by the hammer and grinding.

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and upon a small scale.

The mosaic sent this year from Rome was not so ambitious in character as that which was forwarded in 1851, but, on the whole, the specimens were more varied and agreeable. Signor Gallandt was the principal exhibitor; and while his large and elaborate picture of the Forum testified the ability of the artists he employs, his table tops and smaller objects showed the various and graceful uses to which Roman mosaic may be applied. The Cavaliere Moglia, who is well known for his dexterity as a practical mosaicist, also contributed some very delicately executed pictures.

Exhibitors:

Signor Gallandt;

Cavaliere Moglia.

It is singular that this art should not be practised by any of the other nations of Europe. It would form an occupation peculiarly suitable for females, and in this country or France there could exist no possible difficulty in the making of the necessary "smalti" or enamel sticks of which the work is composed. The Irish, who learn all the elaborate processes of lace-making so rapidly, would, I have little doubt, soon acquire those of mosaic working, if once proper instruction and materials could be provided for them; indeed, in Anglo-

Feasibility of its introduction in Ireland.

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Saxon times, they were the best mosaic workers in Europe, producing in the "opus Hibernicum," effects rivalling the singular glass plâques of the ancient Egyptians.

The efforts made by Napoleon I. to establish the manufacture in France.

It was a favourite idea of Napoleon's, when he was First Consul, to naturalize the arts of Italy in France, and accordingly an establishment for the manufacture of Roman mosaics was opened at Paris by the Republican authorities, under the charge of Signor Belloni. His pupils occupied the old College of Navarre in the Rue de la Montagne Ste. Genévieve, and some of their productions were exhibited at the third Exposition (in the year X. of the Republic). The experiment does not appear, however, to have succeeded very well, for in the subsequent Exposition of 1806, we find Signor Belloni exhibiting mosaics on his own account, made in the Rue des Cordeliers, at his private establishment. The art never seems to have prospered in France, and I believe that it is now entirely extinct.

Florentine mosaic;

Florentine mosaic is a species of marble marquetry or inlaying, generally composed of precious materials in thin veneers or slices, and by taking advantage of the natural shades and tints of the marble, jasper, &c. of which the mosaic is formed, very beautiful effects may be produced.

Its history;

Zobi, who gives us the earliest history of the art of pietra dura, tells us that Jacopo da Turrita, called Fra Mino (said by Lanzi to be a pupil of Guido da Siena), who executed mosaics in the Baptistry of San Giovanni at Florence in 1225, was the first who exercised the art in Tuscany. Subsequently Andrea Tafi learnt the Greek method of vitreous mosaic-working from Appolonius, a Greek, whom he brought to Florence from Venice. In speaking of Florentine mosaic, Zobi says, "I know no existing example in Italy of marble mosaic executed during the first periods of the revival of the arts, excepting the specimen to be seen in the central nave of Siena cathedral, said to be the work of Duccio di Buoninsegna, who lived in the 14th century." The Medici were great patrons of the art, and Ferdinand I. founded the celebrated Fabbrica Ducale of Florence in 1588. Baldinucci gives us a tolerably full list of those artists to whom Florence is indebted for the choicest specimens of mosaic which ornament her galleries and palaces, and through whose exertions the celebrity of the Ducal manufactory was kept up during the 17th century.

expensive character;

The extremely expensive character of this mosaic has always greatly restricted its use; but when it is considered that the hardest minerals only are used in its formation, that every small piece must be ground exactly to a pattern previously cut, and that each

piece of veneer, in order to be strengthened, must be backed by thicker slices of slate or some similar material, the quantity and character of the works produced by the Grand Ducal "Fabbrica" must be looked upon as astonishing. Parts of an altar front lately executed, and intended for the Chapel of the Medici at San Lorenzo, are far superior, in beauty and delicacy of workmanship, to any specimens previously executed at Florence, and show that mosaic has escaped the general decline of the fine and industrial arts in Tuscany.

The materials employed are jasper of various colours, agates, chalcedony, lapis lazuli, and other stones rendered suitable by their colours, polish, or hardness: oriental alabaster, giallo antico, &c. are also used, and are valuable from their beautiful colour and polish, though less hard than the above; ocasionally other substances, such as mother-of-pearl and coral, are introduced. The ground is sometimes made from rosso antico, but more frequently nero antico is used, and occasionally porphyry and other stones of equal hardness. The subjects formerly represented were principally scrolls and conventional ornaments, to which a taste for the execution of landscapes and architectural subjects, such as the Pantheon, the Tomb of Cecilia Metella, &c., succeeded. The result was, however, unsatisfactory, as the inlaid agate work, being entirely dependent, for its colour and gradations of tints, upon the natural colours of the stone itself, is fit only for subjects involving simple forms and but few different tints. Flowers, foliage, shells, and vases are the subjects now most frequently represented, and these are usually made up on tables, paper-weights, brooches, vases, &c.

the materials employed in making it;

The agates are cut by means of a bow strung with iron wire and emery. They are divided into slices about the eighth of an inch thick, and when polished, are cut by the same bow and wire into the forms required. The various pieces composing the subject are put together and cemented upon a slab of sandstone about half an inch thick, which forms a temporary base. The material which is to form the ground colour is cut into slices of the same thickness, and is then placed so as to cover the whole table-top; pieces of the exact size of the objects are cut out of this ground by means of the bow and wire, and it is cemented on to a base of sandstone. The pieces forming the subjects are then removed from the temporary base, and are cemented into the spaces cut in the ground, at once producing the representation intended. The cement used is made of turpentine, wax, and resin.

and processes of cutting and fitting them together.

Such is the present practice of the "Fabbrica Granducale," which has this year exhibited some of its most elaborate

The Fabbrica Granducale;

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productions, for which the jury have awarded a gold medal of honour. This establishment became the private property of the Grand Dukes through the act of Leopold I. (A.D. 1765–1790), and its expenses up to the present time have been solely defrayed out of the privy purse. Thus the Grand Dukes make a present to Tuscany of a flourishing branch of commerce; for all the private manufacturers have been educated in the royal establishment, and derive the principal part of their materials from the same. The essential difference between the productions made for sale, and those got up in the "Fabbrica," is, that in the composition of the former, soft materials are mixed with hard, and in the latter nothing but "pietre dure" are permitted to be used. Thus the grounds of the former are generally of black marble or touchstone, whereas in the latter they are always of either porphyry, Egyptian nephrite, or lapis lazuli. Moreover, a close examination shows that the joints of the one are only approximating to fineness, whereas in the other they are merely hair lines, almost invisible. Some little objection was made by the jury to the designs which had been composed by the professors of the establishment, as being unworthy of the infinite labour involved in their execution, considering that so far as a knowledge of the principles of composition went, the trade were in advance of the "Fabbrica," but at the same time they recognized the pre-eminent claims of the royal establishment on public gratitude.

its exhibition, and influence on the trade.

Signori Bianchini and Buoninsegni.

The best among the private exhibitors were Signori Bianchini and Buoninsegni.

English mosaic in hard stones.

Marbles and agates have long been worked and used at Matlock in Derbyshire for inlaying, but the most commonplace subjects only were attempted till about 1833, when butterflies, birds, &c. were tried in an imitation of Florentine mosaic. In 1840 Mr. Woodruff executed a table top, introducing groups of flowers, fruit, and birds, which was purchased by the late Duke of Cambridge. Mr. Woodruff has subsequently received the patronage of the late Queen Dowager, Her present Majesty, and many of the nobility, amongst whom the Duke of Devonshire has shown great interest in the manufacture, which he has much advanced, by permitting the free inspection of his beautiful specimens of Florentine mosaic at Chatsworth. It will be remembered that Mr. Woodruff's productions formed a remarkable feature in the Exhibition of 1851; and it is to be regretted that he did not appear in 1856. Mr. Hall, of Derby, represented the English "pietra dura" mosaic trade, but did not appear in

Mr. Woodruff;

Mr. Hall.

as great force as upon some previous occasions; not that his work was less well done, but that his specimens were of minor importance, and of less difficulty of execution. Mr. Wyatt on Furniture and Decoration.

It would be unjust to *India* to omit reference to her exquisite skill in the treatment of pietre dure. A marble table-top from Agra formed an admirable specimen of fine inlaying, in which gems of all kinds, cornelians, agates, &c. are made to play a part. It appears that in the year 1608 Ferdinand I., Grand Duke of Tuscany, demanded a passport from the reigning King of Spain for four most skilful workmen in the art of mosaic working in precious stones, whom he was about sending to the Great Mogul; hence we may infer that the Mahommedan sovereigns were indebted to Italian assistance for much of that elegant inlaying which decorates the grand tombs at Agra and Delhi. This may very likely have been the case; but that the Indians were already in possession of all the necessary technical ability, the antiquity of some of their carvings in hard stones, and the universality of the practice of gem cutting, polishing, and inlaying throughout the continent, abundantly prove. Indian mosaic.

Section V.—*Furniture in Lac, &c.* Furniture in lac;

The free importation by the vessels of the East India Company, at the time when they were a trading body, of Chinese and Indian specimens of lac work, no doubt led to the naturalization of the art of japanning in this country. The great father of the manufacture, who fixed its head quarters at Birmingham, was the celebrated John Baskerville, who, after having acquired a large fortune by lacquer work, rendered himself still more celebrated as a printer. introduced into this country by the East Indian traders, and imitated by John Baskerville;

Hutton, the eccentric historian of Birmingham, describes his carriage as entirely japanned, and covered with subjects painted by the best artists of the day upon the panels. To him the late Mr. Clay was apprenticed, and on his establishment in business he gave an extraordinary impulse to the trade by his adoption of an original and admirable process for making papier mâché at once strong and light, by gluing up in a very careful manner successive sheets of unsized paper, and using the material so prepared as the ground on which his japanning was applied. This process is the basis upon which Messrs. Jennens and Bettridge have reared their present colossal business, and it is but just to them to say that up to the present time none of their competitors, and they have many, have approached them in excellence. The jury were much inclined to admire the work improvements made by the late Mr. Clay; and Messrs. Jennens and Battridge;

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of a Prussian firm not very long established, directed with much taste, and producing goods at a remarkably low price; when, however, a piece taken at random among Messrs. Jennens and Bettridge's collection was placed beside the Prussian, the superiority of the former became incontestable. The Birmingham black turned that of Prussia brown; the Birmingham hand polish was clean and smooth to the touch, the Prussian was greasy-looking with varnish, and undulating under the hand; in fact it appeared quite coarse by contrast with the English, the beautiful Indian Bareilhy or Lahore work, and the Japanese specimens sent by Holland. These latter were of singular beauty, and it may not be labour lost to direct the manufacturer's attention to the extremely interesting particulars, as to the practice of the Chinese and Japanese in the production of such goods, collected by M. Natalis Rondot, who has several times so ably reported on the subject.

the superiority of their work over the Prussian.

the Indian Bareilhy work, and the Japanese.

French exhibitors.

In relation to France, it is not easy to trace who the Mr. William Smith was, who, in the year, 1819, obtained an honourable mention for having exhibited varnished furniture, imitating Chinese lac work, in Paris, since the French notices of the art give all the credit of its revival to the late M. Osmont, whose widow is now the principal Parisian exhibitor in the section. This lady's work, as well as that of M. Manfroy, is not equal to the English, and strange to say of an "Article de Paris," its most erring side is the generally bad taste of its design.

French carton pierre and papier mâché.

It is rather in the use than in the manufacture of carton pierre and papier mâché that the French beat us. They combine it so skilfully with carving in soft woods, using the papier mâché only for the parts which are often repeated, that it frequently is made to produce most admirable effects. The best of their manufacturers were Messrs. Huber and Cruchet, who left very little to be desired. They were both rewarded with silver medals. The former exhibited a splendid chimney-piece painted in imitation of marble, and parcel gilt, and containing in a circular recess a good bust of the Emperor. M. Huber also exhibited some Louis XVI. furniture, that possessed within a fraction all the sharpness of that always delicately executed style. The latter contributed a quantity of paneling, in the gallery adjoining the Empress's boudoir, of the most elegant description. A visit to the workshop and "magazin" of either of these exhibitors will well repay the student, for in them he will be able to trace all the fluctuations in Parisian taste for the last 100 years; the best classes of old ornament having

been "surmoulés," and able artists being employed constantly in producing new types of form. Mr. Wyatt on Furniture and Decoration.

Messrs. Jackson and Sons, of London, exhibited first-class goods in all respects. Their large decoration for a portion of Mr. Holford's house was well got up, and their candelabrum was so like metal as to be really deceptive. They most worthily deserved the silver medal they obtained. English ditto.

In the application of ornaments in paste to frames in combination with cheap gilding, several of the German districts showed considerable commercial aptitude. Their specimens could in no case be said to be very pleasing, but their prices undersold every one else. The Prussian and Bavarian were the most remarkable. Cheap German gilding, &c., as applied to frames.

SECTION VI.—*Furniture in Animal or Vegetable Substances other than Woods, and Appurtenances to Furniture.* Furniture in animal or vegetable substances other than woods.

This section includes mats and matting, horse-hair and its substitutes, straw, and cane work, and coarse brushes and baskets.

The most pleasing of all the mats were unquestionably those sent by India; they were principally worked in black, red, and yellowish coloured rushes, and in exceedingly agreeable patterns. Some of the Oriental nations and Algeria also sent mats in nearly similar materials and style. Mats made of rushes.

It would occupy too much space to go into what has been so admirably done by Dr. Royle towards enriching commerce with a knowledge of new fibres, but there is one particular substance which has of late years grown into such importance as a material for mats and matting, and which now gives occupation to such numbers of otherwise probably necessitous persons, that I have felt it right to collect the fullest information concerning it. New fibres commented on by Dr. Royle.

The manufacture of cocoa-nut fibre in England has been in operation about twenty-five years. Mr. Horford, a rope-mat manufacturer, residing at Camberwell, having about that time introduced it into the trade, supplying amongst others the houses of Riley and Lapworth, and Watson and Bell, both of Bond Street. About five years after the above date Captain Wildey (of the firm of Wildey and Co.), a gentleman who had long resided in Ceylon, opened a factory in Holland Street, Blackfriars, for the manufacture of cocoa-nut fibre, which he carried on for some time; he then let or sold the business to Captain Logan. Many other manufacturers started, and amongst them Mr. Dagnall, now of the firm of Dagnall and Tilbury. The manufacture of cocoa-nut fibre in England;

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how originally introduced;

Up to this time the cocoa-nut fibre was obtained by pulling to pieces new ship-cables manufactured abroad from that material, the rope being sent to the London poor-houses in Gray's Inn Lane and Islington to be picked into fibre for the trade at 5*s.* per cwt. This process being extremely tedious, Captain Logan determined to import the cocoa-nut fibre as it is drawn from the nut, thus saving the expense which picking the ropes into fibre entailed. Having engaged Mr. Treloar as manager of his factory in Holland Street, Captain Logan proceeded to Ceylon and other places, where he purchased the fibre, and sent it to England, Mr. Treloar opening an establishment on Ludgate Hill for the sale of the goods manufactured in Holland Street. Since this time large quantities of cocoa-nut fibre have been imported into England; Messrs. Cleghorn and Dunbar, of Billiter Street, City, and Mr. Atkinson, of Fenchurch Street, being about the first importers. The hearth-rug manufacturers availing themselves of the facility afforded by the importation of cocoa-nut fibre, commenced making mats and matting in the winter months when their own trade was bad, and since that time an active competition has taken place as regards the prices and quality of the articles manufactured. Formerly the rugs, matting, &c. were quite plain, but the specimens shown at Paris prove that it is quite possible to place sufficient pattern upon these articles to render them ornamental as well as useful. The Pompeian door-mats, "Cave canem" and "Salve," (exhibited by T. Treloar,) are a good example of what can be done with the seemingly rough and unmanageable fibres of the outer husk of the cocoa-nut, within a few years past thrown away as useless.

and to what perfection now carried.

convict labour, how employed upon it;

The prison authorities have become large manufacturers of cocoa-nut mats and matting, and in prisons where profitable labour is a primary consideration this trade has greatly lessened the expenses of the establishments. For instance, in the prison at Wakefield, in Yorkshire, 500 or 600 prisoners are kept employed at this trade, and their weekly earnings average 7*s.* per week each man. Many other prisons and workhouses also manufacture these goods to great advantage. Two-thirds of the goods manufactured in prisons and workhouses are bought by the agents of Manchester and City houses, and exported to America and the Continent.

Mr. Armstrong's experience;

As an illustration of what may be accomplished by judicious teaching and management, Mr. Armstrong's exhibition of goods manufactured by convicts was peculiarly interesting.

I have been favoured by that gentleman with the following particulars of his experience:—

In 1851, being in business on his own account, he was an exhibitor at the Great Exhibition. In 1855 he obtained an appointment as principal trade instructor in the hearth-rug, mat, and matting department of the Pentonville Prison (for convicts only); this appointment he holds at the present time. Being anxious to become an exhibitor at the Paris Exhibition, and wishing to show goods superior to any before produced by convict labour, Mr. Armstrong obtained permission from the Visiting Director to manufacture them in the prison at his own expense; and having at that time 90 prisoners under his superintendence, none of whom had worked at the trade before, he selected the following:—

in the Pentonville Prison.

No. 1,	registered	as a	labourer	sentenced for life.
No. 2,	„	„	„	20 years.
No. 3,	„	„	„	10 years.
No. 4,	„	„	„	4 years.
No. 5,	„	watchmaker	„	4 years.

The above men were kept strictly separate and on the silent system; they had not been in prison eight months, when under Mr. Armstrong's tuition they made the whole of the goods exhibited by him at the Paris Exhibition. In the Pentonville prison the convicts are kept in separate confinement for twelve months, and are then employed in public works for the remainder of their sentence.

Cocoa-nut fibre as a substitute for horsehair and bristles;

The application of cocoa-nut fibre as a substitute for horsehair and bristles is even more important than its use in a woven state, though it met with little encouragement as long as the fibre was offered only in its raw state; but the aid of machinery and improved means of preparation have enabled the manufacturer to obtain the material in a much more serviceable form, and at a reduced price. The fibre is dyed black, and mixed with horsehair, it is then curled and baked in an oven, and afterwards pulled apart by women; and when properly prepared it resembles horsehair to such perfection that none but a practised eye can detect the difference. Perhaps there are few commodities which have had to contend against so much opposition as the cocoa-nut fibre. A really good, useful, and cheap material, it still had for some years to contend against the interested opposition of what is called the "trade," or middlemen who come between the manufacturer and the public. Even now the cocoa-nut fibre is not so well known to the public as it should be, from its being so extensively used,

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we must not say for adulteration, as it improves while it cheapens, but for mixing with horsehair. Owing to the recent advance in the price of raw hair, the use of cocoa-nut fibre has increased to such an extent, that scarcely any curled hair of the best quality is brought into the market without having a large proportion of cocoa-nut fibre mixed with it.

its advantages.

The cocoa-nut fibre is durable, clean, and cheap. The jurors of the Great Exhibition of 1851 have borne testimony to its merits for bedding in the following terms (*see* "Report of the Juries," page 601): "The use of cocoa-nut fibre for bedding presents many advantages; it does not become knotty or hard, it does not harbour vermin, and it is not affected by variation of climate; it is also recommended by the great cheapness at which it can be produced."

English exhibitors.

Since the Great Exhibition of 1851, the manufacture of cocoa-nut fibre has been greatly developed. Prize medals were awarded to the two following exhibitors:—

Wildey and Co., Holland Street, Blackfriars Road, London, and T. Treloar, 42, Ludgate Hill, London.

Cocoa-nut fibre as applied to brushes;

The strongest of the fibres of the cocoa-nut are now selected and extensively used by brush-makers as a substitute for bristles, for which purpose the material is admirably adapted. It is said that for some brushes, as, for instance, scrubbing and stable brushes, the cocoa-nut fibre is preferable to the best bristles, not only on account of its cheapness, but as being in reality better calculated for the uses to which such brushes are applied. One of the principal manufacturers of cocoa-nut fibre is Mr. Barsham, of Kingston-on-Thames, who has lately obtained a patent for making papier mâché out of the refuse of the fibre.

In London the manufacture of cocoa-nut fibre has increased so much that it employs at present 500 workmen.

and fishing-nets;

A specimen fish-net of cocoa-nut fibre was exhibited at Paris. This is quite a new application of the material, but one for which it would appear to be well suited, no preparation being required (as with hempen nets) to enable it to withstand the effects of constant immersion in water, a fact incontestably proved by the durability of the cable moorings of cocoa-nut fibre at the Mauritius, which are now in as sound a state as when laid down fifty years ago. The development of the trade in cocoa-nut fibre is of the more importance at the present moment, when the interruption to commerce with Russia cuts us off from the best existing market for horsehair and bristles. Belgium, the Netherlands, and the Zollverein provinces produce the best articles

of this kind next to the Russian, but in such small quantities as to keep the material very expensive.

The total annual consumption of cocoa-nut fibre in Great Britain, for all purposes, is now about 5,000 tons, the value of which may be fixed at about 100,000*l*. In France the material is scarcely known, the high rate of duty chargeable upon it acting almost as a prohibition. It is, however, eagerly sought after, and the numerous inquiries made for the articles of cocoa-nut fibre in the Paris Exhibition, prove that a modification of the present duty would lead at once to the introduction into that country of this new branch of industry, and to a large consumption of the raw material.

total annual consumption in Great Britain;

The husk of the cocoa-nut is used in India for a variety of domestic and other purposes, for which its fibrous nature renders it adaptable, but its chief uses are found when it is made into coir, which is accomplished by separating the fibres from the intervening vegetable substance, in the same manner as flax is prepared. Coir ropes have been employed in the East Indies from time immemorial; from their lightness and pliability they are preferable to those formed of hemp, particularly for cables, as they combine strength, buoyancy, and elasticity, require no tar in their fabrication, and are much less liable to decay. Coir does not chafe by friction, a circumstance well known to naval men who have used it for cables or cordage, and who, in nautical language, never "serve" it, as is invariably done with hempen cable.

how employed in India.

There were numerous varieties of miscellaneous articles, such as the horn work of M. Rumpendahl, the "vannerie" of the town of Vervins (Department of the Aisne), and the excellent and cheap truck basket of Mr. Thomas Smith, of Hailsham, which fell as it were by accident into the province of this jury, but of which it is probable a better account may be rendered by some other reporter.

Horn and basket work.

Class B.—Upholstery. Section VII.

Upholstery

The great competition in this department was between France and Austria, the former having unquestionably the best of the contest. French mattresses are of peculiar excellence, and their perfect quality, as exhibited by Desolle and Dupasquier, more than counterbalanced the slight preponderance it appeared to me that Austria gained in feather beds and eiderdown coverings. In the preparation of stuffs for hangings France had it all her own way, the ultimatum of richness being attained in a set of hangings manufactured at Lyons for his Grace the Duc de Luynes. The gallery of designs for industrial Art showed how well

French and Austrian.

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the French understood the arrangement of draperies in curtains, &c., and the display of several of the principal "tapissiers," such as Deville, Mercier, &c., left no doubt as to their facility in carrying out such designs. The English did not exhibit at all in this class.

Decoration.

Class C.—Decoration—

Was divided into two distinct parts, Section VIII. Ornamental Papers and Leathers, and Section IX. Ornamental Painting, including Gilding.

Of these the former includes one of the most important of the export trades of France of an ornamental nature, and one in which we have in many respects much to learn. I dwell, therefore, upon it in some detail.

Ornamental papers and leathers.

Section VIII. *Ornamental Papers and Leathers.*

Introduction of block printing by François of Rouen;

It appears from statutes in France, that paperstaining was recognized as a trade in that country as early as 1586. The earliest blocks for paperstaining were those of François, who carried on a manufactory at Rouen in 1620.

and of flocking by Lanier.

Jerome Lanier patented in England, in May 1634, the process of "flocking;" but though this has now become so important in the ornamenting of paper, that material is nearly the only one to which "flock" could be applied that is not mentioned in the terms of Lanier's patent.

We probably owe the suggestion of paper as a material for wall hangings, to the introduction into England of the beautiful hand-painted papers of China, still occasionally to be met with in old houses; the taste for rich decorations having been given by the Gobelin and Mortlake tapestries, and the japanned and stamped leather hangings of the renaissance.

Paper-staining in England in the 18th century;

We find paperstaining in England recognized as a trade in 1712, by the imposition of a tax of $1\frac{3}{4}d.$ per square yard for printing, in addition to the duty on the paper itself. In 1754 a curious advertisement of Mr. Jackson, of Battersea, informs us that he undertakes the execution of imitations of statues, "lively portraictures" of gods and goddesses, in *chiaro oscuro* on paper. We meet rather later with the names of Messrs. Toole and Young, Graves, Boyle, Hall, Pickering, through whose energy their manufactures acquired much reputation; they established a considerable export trade, not only to several European countries, but also to America. We now import far more than we export.

The great Chelsea manufactory was established by George and Frederick Echardts in 1786, and their papers are still well known in the trade. the Chelsea manufactory.

"Flocking," though so early known, appears to have been lost, or at least unused, from about 1780 to 1800, when it was re-introduced. Arabesque papers, as they are usually termed, were first produced in any excellence by Mr. Sheringham, of Marlborough Street, who induced two foreigners to work in this country. Flocking;

The Government restrictions have always pressed heavily on this trade. The payment of 20*l.* for an annual licence, imposed by the 24th Geo. 3. c. 41., the compelling all paper-hangings to be "executed on first-class paper," 42 Geo. 3. c. 94., the Excise duty on paper of 3*d.* per pound, and the $1\frac{3}{4}d.$ per square yard for printing, combined to keep up the price, and prevent us from competing with the French. Government restrictions.

Before the inventions of M. Didot, of Paris, the improvements made by Mr. Donkin, and the complete patent confirmed to Messrs. Fourdrinier in 1807, for fifteen years, enabled the manufacturers at last to obtain a machine-made paper of any length and width. It had previously been made only in moulds of certain sizes, and in order to print a piece of paper-hanging twelve yards long, the manufacturer was compelled to stick together sixteen or eighteen sheets, the joinings of which it was impossible to conceal. Continuous paper;

Cobb's system of thorough-drying has produced an improvement for some colours, and his patent for embossing has introduced a new character into English paper-hangings. The introduction of satin white grounds (called "satin facings"), rubbed with French chalk till a polish appears, and of shaded, striped, and softened flowers, have given still more variety to the manufacture. modern improvements;

About 1780 the manufacture of paper-hangings passed from England into France. The first manufacturers who established themselves there were Robert and Arthur. They were followed by Reveillon, and the Revolution of 1789 commenced by the pillage of the factory of Reveillon, in the Faubourg St. Antoine. Legrand was the third manufacturer in this trade. All these men opened establishments in Paris. The house of Zuber set up a manufactory at Mulhausen in 1790, and rather later Joseph began business at Macon, from whence he removed to Paris. Several large factories were opened at Lyons, but the chief part of this important manufacture was soon monopolized by Paris, which still retains a leading position, having in this respect followed the example of London. transfer of the manufacture to France about 1780;

to Germany, Belgium, Holland, Switzerland, Austria, Russia, and Spain.

Germany commenced the manufacture of paper-hangings on a limited scale, and later than France; Belgium, Holland, and Switzerland followed, but on a still smaller scale; Vienna, and still later, Warsaw, opened factories for the same purpose, and Russia wasted millions of francs upon its Imperial factory at Syarko Syelo, without any success. In Spain, a Frenchman of the name of Girond de Villette established a manufactory at Madrid.

Introduction to Paris of mechanical processes.

In 1829 the first machine for producing endless lines, by the use of stencil-plates and a revolving brush, was introduced into Paris by the late Mr. Clarke, of High Holborn, through the house of Dauptain, Fils, et Seur, the practice of hand-printing only being at that time in use; the introduction of the new system enraged the workmen, and produced so serious a strike that the establishment obtained from Government the protection of soldiers, and Dauptain becoming frightened abandoned the plan. The other Parisian manufacturers, being equally alarmed, the important improvement was given up till 1831.

Application of paper-staining to the illustration of popular historical subjects.

The application of the processes of paperstaining to the illustration of popular historical subjects, appears to have had its origin in the representation of the victories of Napoleon, in the fourth Exposition (1806). MM. Jourdan and Villard exhibited, by way of great novelty, a decoration painted in a single piece of ten square feet with the subject of the battle of Austerlitz.

The French exhibitors of paper-hangings at the early expositions;

The first notice of paper-hangings we meet with in the catalogues of the objects exhibited at the early expositions, occurs in the year X. of the Republic (1802), from which we learn that only one manufacturer, M. Simon, of Paris, represented the power of the country in this branch of industry. In the collection of the year 1806 we find notices of the existence of the trade at Nancy, Strasbourg, Rixheim, Vienne, Besançon, Neustadt, and Frankenthal, in the Department of Mont-Tonnerre. We find also an interesting record of the improvements effected in the manufacture by M. Prieur, of Paris, an ingenious chemist, who occupied himself in the composition of liquid colours, suitable for printing on paper, and capable of being employed in body colour painting. Among those he produced in the greatest brilliancy were the light and dark greens, mineral yellow, obtained from oxyde of lead, superfine blue, and bright cramoisi, or red lake. Even at this time we find centralization manifesting itself in the preponderance of Paris in the production of *papiers peints*. One district alone seemed to enter into

serious competition with the metropolis, and that one was the indefatigable Alsace. The name of Zuber, of Rixheim, must ever be remembered in connexion with the history of this manufacture. In the year 1819 we find M. Zuber, to whom the jury have now awarded a gold medal, alone competing with the Parisian tradesmen. In 1827 he did not exhibit, and in consequence of the diminution of country competition, the products of the Department of the Seine increased to an enormous extent. In that year we find that "in Paris there were 72 large manufactories of paper-hangings." These vast workshops employed, in preparers, chemists, foremen, engravers, draughtsmen, travellers, work-people, men, women, and children, 4,200 individuals. The value of the white paper employed amounted to 4,840,000f., that of the colours to 2,315,300f., and the exportation from Paris alone to 850,000f. In the design of the papers produced at this time, the talent of M. Mader effected an amazing improvement. In the year 1831 M. Zuber made the most important stride of all in the reduction of the price of such decorations by the introduction of cylinder printing, a process which at once reduced the cost to nearly one half of that previously incurred. His clever mode, too, of blending tints, materially increased the resources of the designer. In the year 1834 M. Zuber appears to have constantly employed 200 workmen, and to have produced 200,000 pieces annually. In this same Exposition, in which the Alsatian house carried off the gold medal, we find M. Cartulat, of Paris, rewarded with a silver one for a beautiful Pompeian design, the first in this style of which we find any notice. In the year 1835 the establishment of M. Delicourt, who has obtained a gold medal in the present Exhibition, was started, and it at once assumed the high position it has ever since maintained. In the Exposition of 1839 M. Delicourt's panel papers and his low prices quite took the world by storm; and in 1844 the enterprising manufacturer obtained the highest reward, the gold medal. It was at this exposition that M. Genoux, who has now gained a silver medal, appeared for the first time, gaining a bronze medal, and he, more than any other at present, appears to me in a good path. His tints, mixed by M. Gerard, his foreman during thirty years, under his designer M. Gruchy, are exquisite.

influence on the trade of the houses of Zuber.

Cartulat;

Delicourt;

and Genoux.

The general aspect of the French papers in the late Exhibition was, to my taste, by no means all that could be wished. Faultless as far as the fitting of the block impressions over one another, as far as the perfect cleanness and precision of

General aspect of the French papers in the late Exhibition;

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exceedingly faulty neglect of first principles.

every tone, and as far as the apparently unlimited range and brilliancy of palette were concerned, the most important specimens appeared to me to tend rather to the abuse of the art. Altogether unmindful of an appropriate *mural* treatment, no caprice seemed too wild for adoption in the showiest papers. Stone balustrades with peacocks upon them, grown over with tropical plants of no particular geographical proprieties, mixed up with shells and all kinds of conceits, forming, with curtains at the side, the framework to washy landscapes with exaggerated air tones, appeared to be rather a popular style. Sometimes sides of apartments were represented divided into panels, in the centre of which appeared to hang, not pictures only, but their frames as well, casting shadows upon the wall, and meant to appear actually standing out from it. Sometimes a curtain in lace, or some such material, would be shown drawn back and looped up in regular upholsterer's fashion. Such were among the numerous puerilities adopted even by some of the best technical masters of their trade. Really if it had not been for one or two exceptional productions, and for the ordinary trade pattern books, it would not have been possible to reward French paper-hanging in the way that it has always hitherto been treated. Any attentive visitor to the galleries of the Exposition des Beaux Arts, could see for himself how profound a study the French architects have made of the appropriate mural decoration of every style and epoch, and yet among all the paper-hangings exhibited there was not one single trace of the benefit such studies ought to have conferred upon the trade. The simple reason why the Parisian paper-hangings were this year so generally outré and bad in design I believe to have been because they were left to painters to arrange, and not properly subordinated to any architectural system.

French exhibitors; M. Delicourt;

M. Delicourt, who cited as his chief assistant F. Dury, and his chef d'atelier M. Rubis, exhibited the best imitation of a picture I have ever yet seen made in a printed paper. The subject was *youth*, treated in a pastoral manner, by no less an artist than Muller. It appears impossible to carry the art further, and the conclusion at which one arrives is—that printing on paper has its limits, which should be studied by the designer, and which cannot be successfully transgressed.

M. Zuber;

The same conclusion applies yet more forcibly to M. Zuber for his landscape, in which the tints are of surprising delicacy;

M. Desfossé.

and tenfold to M. Desfossé, who has had the enterprise to call in one of the first artists in France, Couture, to his assistance. While condemning the taste of these imperfect

pictures, for at best they can be no more, it would be unjust not to render homage to the efforts made by the leading manufacturers to ally the highest talents of the day with their products. The fault is not wholly to be laid upon the shoulders of the producers if great men fail to make good designs. It is chiefly in her delicate flower papers, diapers, chintz-patterned and silken-surfaced papers in light tints, that France beats us industrially. Her workmen are intelligent, quick-sighted, clean-handed, and for the most part they work in light, cheerful ateliers, with flowers, or casts, or engravings about them. The value of such premises, commercially, is not yet half sufficiently appreciated in this country.

Great advantages of clean, cheerful, and light workshops.

A valuable report of M. Zuber upon the manufacture of paper-hangings, read before the Industrial Society of Mulhausen, in 1851, gives the following interesting commercial notice of the recent French and English manufacture :—

The relations of the French and British paper-hanging trades as represented by M. Zuber.

"In England, up to 1825, the manufacture of paper-hangings was protected by the absolute prohibition of foreign papers, but at the same time it was subjected to a tax so onerously applied, that, before the adoption of continuous papers, each piece composed of twenty-four sheets received on its back twenty-four stamps, with two more to mark the two ends ; this duty amounted to about 1*s.* 4*d.* per piece. In 1825 Mr. Huskisson removed the prohibition, and replaced it by a duty on foreign products of 1*s.* per yard square, which, taking a piece of French measurement, amounted to the enormous sum of about seven francs per piece. My curiosity, nevertheless, led me to make an excursion to England, for the purpose of seeing if it were possible to import at this rate of duty, and, to my astonishment, I found I was able to enter into considerable transactions. 'You beat us completely,' was what I continually heard from the English dealers on showing our products. This state of things continued till 1834. Our importations at last pushed the English manufacturers into the improvement of their work, and at this latter date the English Government reduced the customs duty to one half, and took off at the same time the stamp duty on English-made paper-hangings. Our business was not in any way augmented, but the English manufacture made such progress that in 1846 Sir Robert Peel made a new reduction of the import duty by two-thirds, that is to say, reduced it to twopence a yard, or about one franc per piece. A violent shock to the English manufacturer followed, but a salutary effect was quickly produced on it. During the first year of

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the new regulations our importations doubled themselves; they, however, soon fell off again, but not before this heavy competition had impelled the English manufacturers to such exertions, that now, with a duty one sixth of that of 1825, we find a difficulty in introducing merchandise to the same amount as then."

English exhibitors;

The English paper-hangings lately exhibited were not as effective as those contributed for 1851. The best were by the two firms of Woollams, and Messrs. Williams and Cooper. They were soundly made and well printed, at moderate prices, but were sadly wanting in that refinement of colour, which I believe to arise in the French papers mainly from the use of better whiting, more colourless size, finer pigments, cleaner vessels, better light, careful overlooking, and, above all, scrupulous delicacy of manipulation, and not struggling to work too fast.

Messrs. John Woollams and Co.;

Messrs. John Woollams and Co. exhibited in the south-east pavilion a decoration in white and gold, consisting of two pilasters, corners and borders, cornice and frieze, designed from casts at Marlborough House in the style of the Italian renaissance, together with some panels of various flock and gold damasks, in the mediæval style, and a cornice and mouldings from the Alhambra, all of which were from drawings made in England. They showed also some papers produced by cylinder machinery, in relation to which they have favoured me with the following interesting particulars: "These specimens we consider a great improvement on this branch of our trade since 1851. It has always been found difficult, however careful the workman may be, to print small geometrical figures or diapers by the usual method of flat blocks, so as to produce an uniform surface or regularity of work at the repeat, and avoid a shady appearance when hung; this we have now done by means of feeding rollers, by which the flocking mordant is furnished with perfect regularity to the print, and by means of which, and of continuous paper we produce better work than can be attained by the flat block; added to which, the work is flocked by machinery, and produced at the rate of two pieces per minute."

Messrs. W. Woollams and Co.

Messrs. W. Woollams and Co. also exhibit paper-hangings of good average quality, and all that appears to be wanting in their productions is a higher class of design.

Messrs. Williams and Cooper.

The same may be said of Messrs. Williams and Cooper's.

All of these houses have acquired reputations for good, cheap machine-made papers, which are very largely used in this country, and which, on account of the extent of their

employment, it is most desirable should be carefully designed in the first instance; for it is a most just remark of Mr. Redgrave's, that "it is a misfortune, in this age of machinery, that even the first mould or die, which is to be the matrix of thousands of repetitions, has often far less care bestowed upon it than was formerly bestowed at infinite cost on a single work."

Since these papers are so largely manufactured, I add a few particulars concerning them, which I have been so fortunate as to obtain from Mr. Hubert.

English machine-made paper hangings.

Machine paper-hangings, in from one to ten colours, are printed by means of a succession of rollers arranged round a drum, with a colour-box, sieve, &c. to each roller, similar to the well-known process of calico printing, the difference being that the rollers for paper-hangings produce surface work and with body colours, whereas calico printing is done from engraved rollers. Immediately on leaving the printing machine the paper passes into a chamber heated to about 250 degrees, and is thus dried and finished, being produced at the rate of 42 yards per minute, one machine being capable of turning out 1,500 pieces of 12 yards each in a day.

Austrian exhibitors.

Austria exhibited some ordinary papers through the house of Spœrlin and Zimmerman, of Vienna, whose transactions appear to be carried on upon a large scale.

Fancy papers; English;

In fancy papers for packing and book-binding purposes, the English, thanks to the genius, science, and enterprise of the house of De la Rue, stood at the head of the list. The name of Owen Jones, under whose artistic direction the majority of the goods have been produced, is a sufficient guarantee for their originality and beauty both of form and colour. The details of their manufacture more properly belong to Class X. or XXVI., and I therefore leave them to the reporters for those subjects. In France the same kind of papers are produced with exquisite taste, more particularly in small gold and diaper patterns for wrapping up bonbons, &c., in which speciality it was impossible to excel MM. Augrand and Guesnu.

France.

Fancy papers, when first used for ornamental packing.

A certain M. Lambertye appears to have been the first to apply fancy papers in France to ornamental packing. His establishment was in the Marais, and a considerable quantity of glazed, satined, coloured, and plain papers were made from his designs and instructions, at the great establishment of the Montgolfiers at Annonay. The Exhibition of 1806 contained several displays of fancy papers by Messrs. Dodart

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and MM. Schrant, Susse, and Co.; but M. Lambertye appears to have been the first to convert them to that use for which they have since his time been supplied in such vast quantities. Before this time the French had imported from Holland the coloured papers in which their cotton stuffs were usually wrapped. The firm of Desétables, of Vaux de Vin (Calvados), was among the earliest to relieve them from the necessity of obtaining such papers from abroad.

German gilt and fancy papers.

The Germans showed quantities of gilt and ornamented papers, which, it is averred, they produce at a lower rate than the French and English. In the plainer kinds of gilt paper they probably may do so, but neither in marbling, satining, nor embossing, is their work at all upon an equality as to price, excellence being taken into account. The firm of Knepper, of Vienna, produces in vast quantities, and obtained a great medal at the last Munich exhibition. The jury awarded it a silver medal in 1855.

French painted blinds;

Among the exhibitors of transparencies in the shape of painted blinds, the French were by far the best, several exhibiting great ability and real artistic power. The most excellent appeared to me to be Agellant, Morgant, Savary,

and Prussian.

and Bach Pères. Herr Burchardt, of Berlin, showed some pretty good work at moderate prices.

French stamped leather.

Stamped leather is also an article in which the French greatly excel, and of which they make considerable use. There were only two exhibitors of importance, MM. Dulud and Halbedel, both of whose productions were very good, those of M. Dulud being certainly by far the best of the two.

Ornamental painting—

Section IX.—*Ornamental Painting.*

Mr. Moxon; Mr. Kershaw.

In decorative painting there were only three exhibitors of great interest, namely, two English, Mr. Moxon and Mr. Kershaw, and one French, M. Hussenot. The two former were placed by the jury upon an equality with respect to the excellence of their imitations of woods and marbles. Scarcely any objects exhibited in the English department attracted more earnest attention than they did from the foreign workmen, who would frequently stand "*en queue*" to get a good look at them.

M. Hussenot's portable painting.

M. Hussenot's invention consists, so far as I can make it out, in applying a series of coats of oil paint, or possibly of a solution of Indian rubber or gutta percha, upon a soluble ground. Decorations are then painted in oil colour upon the priming, and when they are perfectly dry the original ground is dissolved, and the decoration is drawn off in a

tough pellicle. When wanted to be fixed up, a coating of white lead, or any other substance of an equally tenacious character, is given to the wall and another to the back of the decoration, which, being rubbed down on the face, allies itself indissolubly with the wall. Thus any amount of portable decoration may be worked away from the building to be decorated, and its whole aspect changed with a day or two's labour. The invention is particularly applicable for ornamenting intricate mouldings, which cannot be conveniently got at with the brush.

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SECTION X.—*Furniture and Decoration for Churches.*

Furniture and decoration for churches.

The conservative movement in England has certainly borne better fruit, so far as ecclesiastical art is concerned, (painting perhaps excepted,) than any of the other countries of Europe, mainly inasmuch as our workings in the restoration or rather revivification of the salient features of Gothic architecture are less influenced by preconceptions of other styles on the part of the workman. Our masons have almost insensibly crept into carvers, our carvers almost insensibly into sculptors, following out only one series of types. The French carvers generally are wonderfully dexterous, but not sufficiently imbued with steadiness of aim to adhere with judgment to tradition; hence their tendency is to exaggeration, and unless a sound school of criticism is promptly brought to bear upon much that is now being done, there is every probability that this tendency will cause a serious degeneration in French art, and that speedily.

Gothic architecture and art better realized in England than in France.

This section divides itself into three parts—stone, wood, and metal, those three being the principal substances in which furniture and decoration for churches are usually executed.

Division of the section into three parts—stone, wood, and metal.

To commence with stone.—There were but three exhibitors whose work merited serious notice, the first in importance certainly being the "Dom-Bau-Verein" of Cologne Cathedral, who have fairly earned a gold medal for their creation of a school of ecclesiastical carvers for the purpose of nobly restoring the greatest monument of the middle ages. In a variety of colossal finials, crockets, canopies, and other details they showed a sound knowledge of masonic art and great assiduity, carried in some of the specimens a little too far.

Stone—

The Kölnische Dom-Bau-Verein;

Messrs. Gates and George, of London, contributed a reredos, worked in their well-selected Aubigny stone by William Boulton, assisted by Messrs. Bull and Hammond, and a doorway in excellent Caen stone, executed by the same artists, all of admirable quality, though unfortunately

Messrs. Gates and George, of London;

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so placed as to be scarcely visible in their finest details of treatment.

the Abbé Choyer, of Angers.

The Abbé Choyer, who is at the head of an establishment at Angers for producing ecclesiastical fittings, forwarded, among other specimens, a marble altar very elaborately carved, but without any satisfactory evidence of knowledge of style, or the principles of original artistic composition.

Wood—

In wood work it is to be regretted that we did not enter the field, as I believe some of the font covers, and other objects which have been recently done in England, would have distanced all competitors. France showed only some cabinet specimens, if we except a monster anomaly by the

M. Vincent, of Paris;

Abbé Choyer. M. Vincent, of Paris, exhibited a small chasse, gilt, and closely resembling metal in its treatment. It certainly involved no great difficulties of execution, as it consisted almost entirely of tracery and moulded work; it is, however, but just to add that all that was attempted was satisfactorily achieved. Belgium contributed some large works; the art of which, as well as the prices, were

M. Goyers, of Louvain;

moderate. M. Goyers, of Louvain, sent an elaborate pulpit and tabernacle of average quality; and M. Dumon, of

M. Dumon, of Bruges.

Bruges, a dais of less price and merit. It is a pity that Belgium, which has so recently completed so masterly a work in wood as the stalls of Antwerp Cathedral, should

MM. Cuypers and Holgenber, of Holland.

not have been better represented. From Holland, Messrs. Cuypers and Holgenberg forwarded a pulpit of somewhat similar design to the Belgian, but to my taste rather more pleasing.

Metal—

In metal work we had to deplore the absence of Mr. Hardman, whose place in 1851 was occupied in 1855 by

M. Ponsielgue Rusand, of Paris;

Messrs. Ponsielgue Rusand and M. Bachelet. M. Rusand, working from the designs and under the artistic superintendence of M. Questel, architect of the new church of St. Paul at Nismes, had produced for that church a magnificent altar in latten, entirely wrought in "repoussé," that is, in work beaten up from the back, and back again from the face. This piece certainly was the finest revival of the processes of goldsmith's work in the 12th century which has yet been executed, and reflects infinite credit both upon its designer and executant. Although the style was admirably preserved in every detail, the whole was so artistically arranged as to present an agreeable aspect in all points of view, and scarcely to remind the spectator of the archaism of the period the style of which had been so well reproduced. The enamels and setting of the gems "*en cabochon*" were all that could be desired practically, artistically, and archæologically.

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M. Bachelet, of Paris.

I cannot speak with quite the same enthusiasm of M. Bachelet's production, for which M. Viollet le Duc, the architect, is responsible. As ambitious as, or perhaps even more so in character than M. Questel's, it sought to reproduce a "Maître Autel" of the 13th century. The drawing of every part was good and correct, though falling occasionally into "*petitesse;*" but upon the whole the effect tended towards that of "*quincaillerie*" rather than that of goldsmith's work. The main reason why this impression was conveyed was, that instead of every cap and every detail being different, many were made to do duty several times over, thereby destroying the impression of the whole having been handwork, and consequently putting out "the lamp of life." There was, however, very much to admire in the grandeur of the effort, and in many of the statuettes, which were of exceeding beauty and dignity. Both M. Questel's and M. Viollet le Duc's contributions were pregnant with interest and importance at the present juncture, when styles are, as it were, fighting among themselves for dominion over the present generation. Whatever the upshot of such struggles may be, we cannot but feel that the fiercer the conflict the greater the victory, and the sounder the chances of *peace*, without which the artist can never work earnestly and hopefully.

Unanimity of jury in the leading sentiments of this report.

In concluding this report, it is eminently satisfactory for me to be enabled to record that the above-mentioned blessed element was never absent from the meetings of the jury to which I had the honour to belong; and to express my confident belief, that if in any respect a difference of opinion may be traced in this report from that entertained by the majority, it is in a matter of detail solely; and that, at any rate, I carry with me the general concurrence of my British colleague, with whom the opinions now advanced, in the hope that they may do some little good to the public, as well as to the manufacturer, have been earnestly and minutely discussed.

I have the honour to be, &c.

M. Digby Wyatt, Architect,
Late Secretary to the Executive Committee
for the Exhibition of Industry of 1851.

On Class XXVI., Drawing and Modelling, Letter-press and Copper-plate Printing, and Photography.—By Charles Knight, Juror for that Class.

To the Right Hon. the President of the Board of Trade.

My Lord,

I have the honour to address to your Lordship some observations which, in the discharge of my duty of Juror in the Paris Exhibition of the Industry of All Nations, have occurred to me as being of some possible utility, as indications of the progress of the industrial arts. I necessarily confine these observations to the Class to which I was appointed as Juror, viz. Class XXVI.

Extended range of copying processes.

The processes now connected with those branches of industry, which are associated under the generic name of Printing, have derived and are deriving such an extension from the application of modern discovery that their variety alone becomes embarrassing. The Imperial Printing Office of Austria exhibits, in a collected form, the efforts that are making to extend the range of copying processes. Some of these novel applications may be considered more curious than useful; but they show how strongly the direction of scientific experiment is towards the diffusion of knowledge and art. In the Austrian Printing Department there was a case labelled "L'appareil polygraphique," containing thirty-three divisions, exhibiting that number of various modes of impression, either in the instruments of production or the objects produced. Nearly opposite this case was a very beautiful specimen of wood engraving, representing the Emperor Joseph II. in his youth, examining a printing-press with his tutor. Since the death of Joseph II. in 1790, the wooden printing-press, on which the young Prince is gazing, has been superseded in great part by the most elaborate machinery; and the impressions from moveable types, produced then in Germany, as they were produced 400 years before, have been followed up by the numerous modes of multiplying copies which have become auxiliary to typography and engraving—such as stereotype,, electrotype, chromotypography, lithography, chromolithography, nature-printing, photography, and other processes in which chemistry especially has found a new field of operation.

Printing, and book trade.

An exhibition of industry so universal as that of Paris in 1855, might be supposed to have furnished a fair opportunity

Mr. Knight on Drawing, Printing, &c.

of comparing the progress of various countries as to the mechanical excellence of their manufacture of books, and the general character of the demand for books. It did so, in many respects. In others it offered no satisfactory criterion. The printing of Great Britain, and of the United States, was most imperfectly represented. We may account for this as regards our own country. The printers of books with us are rarely the publishers. The printer, in most cases, is employed by the publisher; and when his work is delivered he ceases to have an interest in it. Our publishers, with some exceptions, appear to have considered that the knowledge and experience required for the combinations of various branches of separate industry to produce a book, are not such as would establish a claim for distinction in an international exhibition. The book trade of Great Britain, and the printing art, were therefore little conspicuous in the Exhibition of 1855, especially by comparison with the French printers and publishers, who, in numerous cases, unite the two characters. It was the same in our Exhibition of 1851; and J. S. Van Doosselaere, a Belgian printer, who reported upon the typographical department, says that the English printers did not exhibit because they were afraid of France. No such fear prevailed then, or in 1855, and yet few English printers exhibited. This is a matter of regret; for in two important branches, which sufficiently represent the intellectual progress of the country, the advance is very remarkable; 1st, in that class of books, in which the best machine printing is used to produce moderate-priced books in as good a style as the highest priced twenty or thirty years ago; and, 2d, in those periodical publications of enormous sale, of which wood engravings constitute the principal feature. It is most important to know that the art in England has made the most decided advance in its application to the production of cheap works in very large numbers. Nor is it behind in the most expensively printed books. The expense only has regard to the quality of the paper and the press-work; and the latter expense is of less consequence every day from the great improvements in the ordinary machinery, both in the inking portions, and in a mode of preventing the sheets, as they pass through the cylinders, from being blurred or "set off," as it is technically called. Such machines are coming into use in several of the best printing offices of London. These improved machines are chiefly French. (See p. .)

Provincial book-manufactories in France and Belgium.

There is a peculiarity in the book trade of France, and also of Belgium, which is worthy of remark. Paris is not, as London is, almost the exclusive seat of the book manu-

facture. With us Edinburgh is the only other great centre of literary commerce. In France books are largely produced at Tours, Châtillon, Limoges, Lyons: in Belgium, at Tournay, Malines, Liège, as well as at Brussels. As a consequence, the production of books there resolves itself into a branch of the factory system, where large numbers of workpeople are gathered under one roof to perform all the operations necessary for the manufacture of a book, with the exception of paper-making. In London, on the contrary, the letter-press printer is very rarely a lithographer or a bookbinder. These combinations belong to our very small provincial establishments. In France they belong to the very largest. The following are instances :—

The specimens of Mame and Co., of Tours, and the details of their establishment, which they addressed to the members of the Jury, suggest some important considerations with regard to the attainment of an extreme point of cheapness in the manufacture of books. I use the word "manufacture" advisedly; for we have no example in Great Britain of a large factory in which, with the exception of the paper, all the processes connected with printing and binding, including the arts of the designer and engraver, are carried through for the production of about eight hundred different volumes, varying from the small prayer book, bound, for 35 centimes, to the folio local history, splendidly illustrated, for 100 francs.

In the London Exhibition of 1851, Mame and Co. received a Prize Medal "for the extreme cheapness and great variety of books printed, bound, and published by them." An examination of their catalogue not only shows the "great variety" of their publications, but points out, in the very nature of their works, that the "extreme cheapness" is attained by the continued production of large impressions for a constant and universal demand. The nearest parallel case in England is that of the production of Bibles, Testaments, and Prayer Books by the Universities and the Queen's Printer. But cheap as these privileged English books now are, they can scarcely compare with the "Liturgies" and "Offices" produced by Messrs. Mame, especially those which are luxuriously bound. The "Missale Romanum," in folio, beautifully printed, is sold, unbound, for 11 francs; the most exquisite binding in morocco, fully gilt, adds only 20 francs to the price. The "Paroissien Romain," 32mo, a very nicely printed volume of 636 pages, solidly bound in black sheep, marbled edges,

costs only 80 centimes (8*d.*); the same in calf, gilt edges, 1 franc 20 cents. (1*s.*); and in morocco, 1 franc 70 cents, (1*s.* 5*d.*) The demand for "Livres d'Offices" and "Livres de Piété" is of course constant and universal; and of these Messrs. Mame have fifty-one different works and editions. Some are remarkable for the clearness of their type, others for the beauty of their embellishments. The "Paroissien Romain Illustré" has coloured borders to every page, with a vignette border to each division of the services. Bound in morocco, with gilt edges, it costs 3 francs 25 cents. (2*s.* 8½*d.*) In the catalogue of Messrs. Mame there are 720 works, exclusive of their "Offices." They consist for the most part of various series devoted to education and primary instruction. Here again is a class of books in universal demand; we have "Bibliothèque Illustrée des Petits Enfants;" "Bibliothèque de la Jeunesse Chrétienne;" "Bibliothèque des Ecoles Chrétiennes;" "Bibliothèque des Petits Enfants;" and "Bibliothèque de l'Enfance Chrétienne." Each of these Bibliothèques contains several series, at various prices, from 3 francs to 10 centimes the volume; some neatly bound in paper, some tawdrily. The greater portion of the books belong to history and geography, others are standard works of fiction. In the "Bibliothèque de la Jeunesse Chrétienne" we may take as a specimen a translation of "Robinson Crusoe," in 12mo, with twenty-four admirable woodcuts, each the size of the page, two volumes, at 75 cents. each. We have nothing so beautifully printed at such a price. We must notice, however, that the figures we have given represent the wholesale cost.

Without knowing the rate of wages at Tours, we must be satisfied to conclude that a great deal of this extreme cheapness is produced by the use of the most improved mechanical processes, and by the most perfect division of labour. It appears that twenty cylindrical printing-machines are employed, producing 15,000 volumes a day, of ten sheets, or 150,000 sheets. This is about the English rate of 1,000 an hour. A volume bound in morocco is stated to pass through eighty hands. The number of work-people employed in this factory amounts to twelve hundred; and we may assume that a large proportion are women and children; for it is stated that "the workshops, surrounded with gardens, are kept in winter at an equal temperature, combine all the elements of salubrity, and offer to the numerous children who therein work, without fatigue, a more healthful shelter than the paternal home."

In the establishment of M. Cornillac, at Châtillon, a hundred and forty work-people are employed, chiefly upon religious works. In the house of Martial-Ardant (Brothers), at Limoges, one hundred printers and one hundred and fifty bookbinders are employed. In the same town Messrs. Barbou employ eighty printers and one hundred and fifty binders; and they have a list of three hundred different works which they keep on sale. The house of Castermann, of Tournay, employs a hundred work-people, and that of Dessain, of Malines, a large number. All these establishments, which are upon the principle of combining labour which has no similarity except in its direction to one product, are almost exclusively for books in the most extensive use, and of these the Offices of the Church and school books are the chief.

Prices of books.

I have given examples of cheapness in the books issued by Mame and Co.; and in other provincial establishments where popular works are produced "*pour le bon marché*," cheapness is an essential quality. Something of this is to be ascribed to the principle I have pointed out, of the combination under one roof of all the various industries required for the production of a book;—those of the type-founder, the letter-press printer, the draughtsman, the engraver, the plate or lithographic printer, the colourer, the binder. The proprietors of these factories are also the wholesale and retail vendors. This is the case in Paris, where many of the most eminent booksellers are their own printers. Some portion of the cheapness may therefore be attributed to the circumstance that the publishers are remunerated by the manufacturers' profit In the book trade of England, on the contrary, the publisher has a separate profit from that of the manufacturer. But there are other elements in the comparative cheapness of foreign books. There is the lower price of paper, from the absence of any paper duty. There is also the lower rate of wages, which is considerably less than the rate of England, especially in the compositors' department of printing. Comparing a French book with an English book, it will be noticed that what is called "the justification," that is, the evenness of space between one word and another in each line, is much more carefully preserved in the English book. This is one of the niceties which distinguish a good compositor from a careless one. In France, where the compositor is paid at a lower rate, the nicety is disregarded. Again, taking the average of English works, they are more correctly printed than the French, especially when a quotation is introduced from another

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language. It is not that the English compositor is better educated than the French, for it is greatly to be regretted that our race of scholarly compositors is almost extinct; but it is that in England the reading of "proofs" is charged in addition to the composition, whilst in a French printing office, speaking generally, no such charge exists.

The books of the Belgian press were published at a much lower rate than those of France, under the system of piracy which existed before the law of international copyright was introduced. J. S. Van Doosselaere, in his tract, which I have mentioned, says, that the Belgian publishers ruined themselves by the competition in non-copyright works (*réimpressions.*) A novel issued by one publisher at 2fr. 75c. was published by another at 75c. We can still see traces of this competition, in which the literary labour having been common to every plunderer, the outward quality of the book—the paper, the printing—was proportionally degraded to the lowest standard of unnatural cheapness. In the French Exhibition, the Belgian books, taken as a whole, are very indifferently printed. The public have been led to consider cheapness the first condition, and now, when that condition cannot be obtained by literary piracy, it is partially obtained by inferior typography. No doubt there are exceptions. The red and black printing of breviaries, and especially of music, is very excellent.

Large and small establishments.

The Directors of the Imperial Printing Office of Austria have done great service to the various arts connected with printing, by bringing together every attempt at discovery and improvement, and exhibiting their results. The Imperial Printing Office of France has vied with these efforts, and since 1851 has produced books which are splendid examples of the perfection of typography. We have exhibited nothing that can stand by the side of the printing of these great establishments, with their prodigality of illuminations in gold and colours, but a few books produced by the ingenious proprietor of a small establishment at Hertford. The success of Mr. Austin shows that the most beautiful books may be produced, as Baskerville produced them, in narrow workshops as well as in splendid factories. The essential condition of such production is, that the head of the establishment should feel an intelligent pride in his art, rather than regarding it as a mere commercial venture. Comparative excellence may be obtained under the most adverse circumstances, when there is judgment to organize and taste to direct the work of individual artisans. There is a singular evidence of this in a music book exhibited in

the Prussian department. It has a title page of an original design: it is excellently printed from music plates; it is very well bound in morocco; and the leaves and cover are cut in a fanciful shape. This music book was produced in the prison of Moabit, near Berlin, where the prisoners are in separate cells. No one workman had communication with the other; but their labours were combined under one direction. The designer, the engraver, the printer, the binder,—and there must be several subdivisions of their labour,—were thus put into harmonious operation. This is the course of most of the printing and binding establishments of the provincial towns of France, of Germany, of Italy, of England, of America, and even of Australia, and in many cases the inherent difficulties of small establishments are partially overcome. But to carry out, in their great varieties of combination, the new appliances that have changed the old name of "typography" into "polygraphy," requires capital, industry, and intelligence that belong to few. Nor is it necessary that such attempts at discovery and improvement as constitute the great merit of the Government printing offices of France and Austria should be imitated by private enterprise, till their commercial value becomes to some extent apparent. But it is the indifference to manifest improvement which is the besetting sin of the mere commercial mind, as the aptitude to see a great result in a scientific experiment distinguishes the enlightened manufacturer from him who pursues his calling without knowledge and without love.

New processes.

I will endeavour to take a rapid view of the new appliances, as shown in the French Exhibition, which afford the probability of ultimate extension of the copying processes, as belonging to books and engravings, as well as those which, originating in imperfect attempts to produce curiosities, have already formed, or are forming, branches of commerce.

Applications of electro-typing.

In type-founding, machinery has been introduced instead of the common mode of casting each letter in a separate matrix. In the great French foundries of Plon and of Laboulaye, as well as in others, many ingenious applications are to be seen. In our own London foundries of Caslon, Figgins, and Besley, as well as in provincial foundries, we have the most beautiful as well as the most useful modern founts. It is in the adaptation to particular classes of printing that we find the practical good sense of our type-founders, as in most other trades. A type of a different character is required for a newspaper than for a book—a

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type compact, not too fine, very enduring. This quality of sustaining great and constant wear has been accomplished, in types faced with copper or other metal, by the galvanic process. But this beautiful discovery of electrotyping is producing results which stereotyping has never attained. A cast from type metal, from a woodcut especially, cannot have the sharpness of the original; an electrotype rather adds to the sharpness than diminishes it. The rapidity of the process is also most remarkable in skilful hands. The woodcuts of "The Illustrated London News," and of other illustrated papers, are thus duplicated, so as to meet the large demand in a limited time. The large plate of the Austrian types of all languages, thus produced by the galvanic process, was noticed in the Jury Report of the Exhibition of 1851. The same description of plate, with the Calmuck characters added, measuring 540 square inches, was exhibited in 1855. But the Austrian printing office shows new activity in connexion with the capabilities of electrotyping. One of these new processes is called "stilographie." A plane surface is covered with a preparation somewhat like the waxen tablets upon which the ancients wrote. It is composed of two parts of shell-lac and one part of stearine. On this material the draughtsman makes his design with a style. This forms a matrix, from which an electro-type is taken in relief; and from this another plate is taken, which answers the purpose of an incised copper, and is worked at the roller-press. It furnishes a readier mode to the artist than the etching process, but it is scarcely so effective.

Nature-printing.

The art called Nature-printing (in German, "Natureselbstdrück") had not made sufficient advances to be exhibited in 1851. The Austrian printing office in 1855 showed to what beautiful and useful purposes it might be applied. The identical reproduction of any natural object, —a plant, a feather,—by taking its impression on a sheet of lead by an application of cylindrical force, and then producing a galvanic plate which will give impressions of the form, and giving also the colours by separate impressions of the similarly coloured parts, is an onward step in printing which has already taken a commercial shape in England. The admirable plates of Ferns, now publishing by Messrs. Bradbury and Evans, are quite equal to the Austrian examples.*

Curiosities of the galvanic process.

There are some applications of the galvanic process exhibited in the Austrian department which can scarcely be

* The history of the art, and the description of the process, are given in a pamphlet by Mr. Henry Bradbury.

called very useful or suggestive. Such are electrotype copper casts of animals intended for the instruction of the blind in zoology; such also are electrotypes of a work of art, such as a large medal, constantly reduced in size through many gradations. This result is produced by taking the successive moulds in gelatine, each mould shrinking considerably in comparison with the previous mould. Could the requisite fineness of the mould be equal to its capacity for becoming less, the principle might be applied to the production of reduced copies of woodcuts.

Chromotypography, and chromolithography.

The process of printing in colours from engraved blocks and metal plates, as well as from lithographic stones, and the combination of an engraved outline as in Baxter's mode, are well known. There is nothing very remarkable to be noted in the extension of the principle; there is, however, this fact shown in the French Exhibition, that very beautiful results may be produced by inexpensive arrangements. Thus, in the Austrian department, by the side of the magnificent work in chromolithography on "Diseases of the Skin," we have a collection of classical figures, the outlines of each being produced from an engraving, and the colours given in a neutral tint by separate plates. The combinations of colours are very beautiful, but the result is accomplished with only four colouring plates, thus :—

blue—red.	*pink—ochre.*
combined: *purple.*	combined: *brown.*

These valuable studies are for schools. In these applications of colour to produce, by mechanism, works of art that have a great deal of what belongs to manual excellence, and oftentimes something beyond, there are two modes of encouragement. The first is large demand. None of the elaborate miniatures and borders of the monastic artists are more beautiful than those in the missals of Messrs. Engelmann and Graf; and yet an exquisite work of this nature is sold for 24 francs. On the other hand, the magnificent copies of ancient drawings published by M. Hangard Maugé could not have been produced as a commercial enterprise, but required that liberal encouragement of the Government which he has received. Whilst noticing works of coloured art that are adapted for an extensive demand, I should mention the very beautiful copies of drawings published by M. Renaud. These are produced from three or four plates, but they are quite equal to the hand-coloured plates in Chamberlayne's "Heads of Holbein;" and yet each is sold

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for 40 centimes. There are from the same publisher coloured prints of flowers far exceeding in grace and delicacy any production of the kind that I have seen, which cost only 1 franc. The application of such coloured engravings to the purposes of schools of design is very obvious. In many of the most valuable elementary engravings our own school has done a great deal. Without going into the expense incurred by the Prussian Government in the architectural and other works, of which specimens are shown in this Exhibition, we might advantageously find a middle course in the various capabilities of printing in colours to produce something higher than has yet been attempted.

Zincography.

Engraving on zinc plates has been used in England for music, and for inferior specimens of art. But zinc engraving has been applied to higher purposes, by a process which is the invention of M. Forster, an eminent Austrian architect. The etching is produced in the ordinary way, with a common biting-ground. But by the application of weak nitric acid to the zinc plate, it is so hardened that it will give 10,000 impressions; and the peculiarity of the material is, that it will allow a much greater rapidity of printing than from a copper-plate. The engravings exhibited show that this process is well adapted for architectural plans and elevations.

Imperial Printing-Office of France.

The national printing-office of France has been established for more than two centuries. It concentrates within itself all the printing of the Government departments, and thus adopts all the mechanical means of rapid and cheap printing. But it does what a Government may most properly do without interfering with commercial enterprise. It prints magnificent works in the highest style of art, with a costly luxury that cannot be approached by private means; and it thus leads the way to excellence in less onerous undertakings. Since 1851 the most strenuous efforts have been made to render the works of the French Imperial Printing-Office equal, if not superior, to its Austrian rival. Its reputation for Oriental typography was fully recognized in the Exhibition of London; but during the last four years it has produced works in other branches, which may be reckoned amongst the first specimens of the typographical art. The folio volume "De Imitatione Christi" combines all that is most remarkable in the union of the most tasteful embellishment with the nicest operations of simple typography. This book is full of coloured engravings; every page has a different coloured border; the initial letters and titles are radiant with gold. But the brilliancy of the black ink in

the common text is as admirable as the harmonious colours of the frame which surrounds it. The book is a great work of art, executed under the direction of first-rate artists.* The fidelity with which the drawings have been rendered by the printers' skill was shown in one especial instance. One of the jurors of my class expressed a doubt whether the *lake* colour was as pure as it ought to be. On visiting the printing-office the original drawings and the printed copies were put before us, and the *fac-simile* was acknowledged to have reached perfection.

But the advantages of the French printing-office are not confined to works of such magnificence as the "De Imitatione Christi." It produces books of utility, such as individual publishers could not undertake. Such a book is the Siamese dictionary, "Dictionarium Linguæ Thai, sive Siamensis, interpretatione Latina, Gallica, et Anglica illustratum, auctore D. J. B. Pallegoix, Episcopo Millensi, Vicario Apostolico Siamensi, 1854." In giving an English, as well as a Latin and French interpretation, the French Government shows that it has not undertaken this work, so valuable to us in our commercial relations, in any spirit of exclusiveness.

There are two curious books issued recently from the Imperial Printing-office, which are memorials of the intercourse of France and England early in the sixteenth century. The one is entitled "L'esclarcissement de la Langue Francoyse, compose par Maistre Johan Palsgrave, Angloyse, natif de Londres, et gradue de Paris, M.D.XXX." The other, which is bound in the same volume, is "An Introductoire for to lerne to rede, to pronounce, and to speke French trewly: compiled for the Lady Mary of England, daughter of Henry VIII."

Works of popular instruction.

In the publications of the French Imperial Printing-office, I see no endeavour to produce, at the expense of the State, those works of popular instruction which may be safely left to individual enterprise. It does not attempt to manufacture books for schools, or assume for itself, or concede to others, a monopoly of works of religion. The vast establishments which I have noticed, for the production of works in large demand, supply that competition which is sufficient to ensure cheapness and excellence. I observe, in this exhibi-

* This book, expressly undertaken for the Exhibition of 1855, was not commenced till March 1854. Eight hundred and seventy-four original designs of ornament were confided to M. Toudouze. He died at the commencement of the work; and the undertaking was completed by his widow.

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tion, that other governments, instead of printing works of elementary instruction themselves, give encouragement to the production of those which are necessary for the humblest schools. Thus in Austria a variety of copybooks for writing classes are printed by Winiker, at Brünn, and are sold at a rate of cheapness which would be impossible except with a very large demand. These copy-books are produced, not from copper-plates, but from letters cut in relief, and are worked at the ordinary printing-machine. Eight leaves thus printed, of good quarto post, are sold for $3\frac{3}{4}$ centimes, or less than a halfpenny. In Belgium, Magnée, of Brussels, publishes a number of engraved copybooks, "for the primary communal schools," which are bought by the Government. The school Atlases issued by the fine establishment of Perthes, of Gotha, where 300 hundred persons are employed in designing, engraving, lithographing, printing, colouring, and binding maps, are largely used in the Government schools of Germany, and also of Prussia.

School instruction in geography.

For school instruction in geography, there is an ingenious contrivance, exhibited by Reimer, of Berlin, which might well supersede the ordinary "black-boards." It is a large outline map of Europe, about 2 yards by $1\frac{1}{2}$. The countries are printed in black upon a blue ground; but the lines of the great rivers, the lakes, &c., are cut out of the black. Thus, when the map is hung up, the pupils write the names of countries, districts, towns, upon the black ground; the rivers and coasts indicating the leading features of physical geography. But the chalk marks upon a "black-board" can be rubbed out. So with this map; for it is made of water-proof cloth, on which the colours are printed. The price is 15 francs. Wohirabb, of Vienna, exhibits cheap maps on paper, on which the rivers and seas are printed in blue upon a buff ground. The principle of indicating physical features in this manner has long been used with us. In these Austrian maps it is called "le nouveau procédé typographique."

Isometrical projections.

The application of colour-printing to scientific purposes is shown in several instances. Zimmermann, an Austrian publisher, exhibits various isometrical projections of machines printed in body colours.

Railway statistics by curves.

Engel, of Vienna, has produced, under the direction of Professor Stummer, a most ingenious and curious mode of exhibiting by curves all the important facts connected with the "Railway of the Emperor Ferdinand" from 1838 to 1853. This history, which at once addresses the eye, is

printed on nine sheets, on which each year presents eighteen points of railway management. These points are:— Mr. Knight on Drawing, Printing, &c.

Monthly gross receipt.	Market price of shares.
————passengers' fares.	State of railway, yearly.
————waggon business	——— telegraph, yearly.
Yearly military transports.	Register of locomotives.
———freights.	————waggons.
———miscellaneous parcels.	Condition of engines.
Shares and instalments.	Historical events.
Yearly capital and stock.	Rising state of enterprise.
———management expenditure.	Depressed state.

The intricate comparisons of figures, which perplex shareholders, are thus obviated, and results of management, month by month and year by year, are seen at a glance.

Amongst the most valuable applications of chemistry to typography is that of Messrs. De la Rue for printing stamps in fugitive ink. The blotch by which an ordinary stamp is defaced may be removed; but there is no acid or other agent which can remove it that will not at the same time obliterate the stamp itself. In mentioning the name of the firm of De la Rue, I may properly notice that in their establishment in Bunhill-row, all the nicest processes of printing are combined to produce their playing-cards, diaries, and ornamental papers, as exhibited in Paris. The practical printer may there learn how the finest work is most effectually obtained by using dry paper instead of wet; how the surface of the paper is improved, in the highest degree, by passing through the most powerful rollers; how silk tympans allow an evenness of impression which cannot be obtained by hard and irregular parchment; and how many other little niceties, the results of long practice based upon scientific investigation, show how the printing art may become a medium for the most unwearied exercise of taste and ingenuity. Stamps in fugitive ink.

During the last twenty years there have been various attempts to produce a machine that will, to some extent, supersede that portion of manual labour in printing which is called "composition." Without attempting to describe the various contrivances by which a more rapid method of arranging moveable types was to be effected than by the ordinary method, it may be sufficient to say that by keys, like those of a pianoforte, some force might be applied to remove a single letter from its proper receptacle, and arrange it in a combination of words and sentences. In the ordinary method, the various types which are necessary for the usual languages lie in separate cells before the compositor, those most in use being nearest his hand. In his left hand he Composing and distributing machine.

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holds a little iron frame, in which, picking up letter by letter, he forms words, putting spaces between each word. As he approaches the end of his line, he finds that the next word is too long to come within the line, and he therefore divides it by a hyphen, or carries it over entire to the next line. He then spaces out the words, so as to make the line fit closely, but not tightly. Now it is evident that if the most perfect instrument could be made to pick up the letters and spaces, the intelligence of the workman is absolutely necessary to make this "justification," as it is called, of each line. Hence, every composing machine must be an imperfect instrument.

But, nevertheless, it may in some cases be of the utmost importance to have the types picked up, and placed in order more rapidly than by the fingers. In a trial of comparative expedition between the logographic system of Major Beniowski and the common mode, (in which trial Mr. Rennie was referee,) it was found that a compositor at Mr. Clay's printing office picked up and "justified" 6,000 letters in two hours and twenty minutes. He distributed or returned the same when used to the cases in fifty-one minutes. There were several composing and distributing machines in the French Exhibition; but the most remarkable one, and that which appears to me, as it appeared to M. Didot and other competent judges, to approach nearer than any other invention to the accomplishment of this long sought-for object, is thus entitled: "Machine à composer et mettre bas pour l'usage de l'imprimerie, composée et executée par Christian Sörensen." It was stated that a Copenhagen newspaper, of which a copy was shown, has been printed for some time by this method. It would be impossible to convey an adequate notion of the details of this machine without drawings. I will endeavour briefly to state the principle:—The types are of the usual thickness and height. In the centre of each type, in the front, is a deep nick of a dovetail shape, which fits upon a metal edge, so that the type cannot be displaced. But of 111 letters which are required in the fount, each letter has two, three, or four other nicks cut at right angles, the nicks of no one letter being the same as another. A cylinder, which may be described as a large basin, has a number of metal edges placed vertically in its sides, upon which the types, without any regard to order, being the matter for distribution, are rapidly slid by the dovetail nick. When the basin is filled, it is inverted upon a cylinder of corresponding size below. Upon the rim of this cylinder is a separate opening for the reception of each of the 111 let-

ters; but no one opening is like another. The distributing and the composing go on at the same time. The compositor is seated; with a treddle he moves the upper cylinder, which, as it slowly revolves, finds in the lower cylinder, which is stationary, a fit place for every separate letter as it descends by its own gravity to the bottom of each metal edge. The *n* having two broad nicks, one about $\frac{1}{8}$ of an inch from its top, the other at the same distance from its bottom, falls into the *n* opening, which, having points corresponding, alone can admit it from its similarity of form; while the *u* having four nicks, two broad and two narrow, passes into its own division, and cannot be confused with the *n*.

But whilst this process of distribution is steadily proceeding, without any care but to keep the upper cylinder occasionally supplied with new material for its operation, the process of composition is rapidly going on. The compositor sits before a compact little frame of keys, each key having a connecting wire for each division of the lower cylinder. He strikes a key, and the lower letter is instantly detached and falls into a funnel-shaped receptacle below, where, without being inverted in any way, it runs into a grove, and arranges itself, in its proper order, in the line of its fellows. This is a long line of several feet. By an ingenious contrivance, each such line is passed on one side, as it is completed, to another workman, who takes up as many letters as will fill the due width of his page or column, and spaces out the words in the ordinary way. I saw 1,000 letters thus placed in line in the short space of four minutes; and the spelling and punctuation appeared as correct as in most matter of common composition before it is read. When the necessary loss of time in refilling the cylinders, and through other hindrances, is taken into account, it was stated by the exhibitor that 50,000 types are set up and distributed each day. This gives a rate of about 6,000 an hour, which is treble that of the ordinary compositor's rate.

The price of the machine is 7,000 francs, with 200lbs. of type with the proper nicks.

Printing machines.

I have alluded to the printing machines of France, in which several important improvements have been applied to the principle of the cylindrical machines in common use in England. In the Paris Exhibition several machines, offering the advantages of more perfect inking, and of preventing what is called "setting-off," showed that the attention of the French printers had been more directed, than with us, to the practicability of producing the finest work by the machine instead of by the hand-press. Some of our artists, who have watched the dependence of the

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wood-engraver upon the printer, have long been of opinion that the equal operation of the cylinder is superior to the irregular force of the hand-press. But the heads of our printing establishments have generally considered that the cylindrical machine was only calculated to save labour, and not to produce fine work. Our machine-makers have, therefore, made various labour-saving machines upon the principle of flat-pressure; which, as it is the principle of the hand-press, at which the most expensive work was produced, was thought to be the only principle for a more perfect machine. The French, on the contrary, have turned their attention to the perfection of the cylindrical machine; knowing that it had natural advantages which could not be obtained by flat-pressure. When a sheet of paper is brought into contact with an inked surface of types, by being laid flat upon that surface, a large volume of air has to be expelled by the heavy platten operating at once upon the whole surface. The cylinder, on the contrary, touches the type, and produces the impression upon the paper, line by line, and there is no atmospheric resistance to be overcome. The French printers have, therefore, sought for the improvement of the cylindrical machine. The single-cylinder machine of M. Dutartre produces work which cannot be excelled by the most careful operations of the press. It prints only on one side; and the "form" passes under a double set of inking-rollers, at each end of the table, before it receives the impression. In the double-cylinder machine of the same inventor, a waste sheet of paper is interposed so as to prevent "setting-off;" and thus both sides of the paper may be printed at once, without leaving that blurred impression of one side which so commonly disfigures machine-printing. The French printers now do their finest work by the cylindrical machine, and much of their common work by the hand-press.

I think, upon a candid examination of the average work of the French printers, that, on the whole, it is superior to that of the English, as regards the evenness and clearness of the impression. The use of improved cylindrical machines has much to do with this. But there is another cause of inferiority not so easily to be overcome. Our paper is inferior, taking the general quality of printing paper. It is not made of so good material as the French; and although, considering the difficulty of obtaining good material, the manufacture has been greatly improved, yet an English sheet of paper has not that substance and surface, without which the most careful printing cannot be effective. The paper duty, compelling the use of expedients

for keeping down price, produces that delusive article of commerce which, bleached, sized, and glazed into a sheet of white paper—a product of much rubbish and little rag—is rotten or harsh—has one rough side and one smooth—resists ink, unless saturated with water—has to be vamped up again, after printing, with rollers and hydraulic presses; and, when formed into a book, requires to be handled with a tenderness that presupposes books not made for use.

Photography.

To copy forms by the action of light is one of the greatest discoveries of science working for the extension of art. In multiplying copies of photographic representations, the art enters into the domain of printing. Thus M. Blanquart Evrard, of Lille, who exhibits seventeen volumes of photographs, entitles them as productions "de l'imprimerie photographique de Lille." This publisher claims some original merit in discovering a more rapid and effectual reproduction of photographs. His works are very good; but nevertheless they are not products of printing properly so called. In the great photographic workshops of Paris and London, we see how, in the application of this beautiful process to the multiplication of unlimited copies, by light acting upon prepared paper through what is called "a negative," the most extended diffusion of any work of art may be obtained. But as the process is slow, demanding constant watchfulness and experienced skill, such copies must be necessarily high-priced. Whatever be their cost, however, they are of great practical utility in the higher branches of industry. It is not my province to notice them as works of art; but when we view the exquisite copies of ancient drawings made by Mr. Thurston Thompson, and the life-like zoological portraits of another English photographer, Mr. Miers, we cannot but feel how desirable it would be that such works should be as widely diffused as a sixpenny engraving. The great merit of photography is its unapproachable fidelity. It is a truth. The efforts which are making to render photography a real printing process are shown in the Paris Exhibition. The great result to which photography is tending is to make the sun an engraver as well as a painter. In the great lithographic establishment of M. Lemercier photographs are produced upon stone, from which copies can be taken in the usual manner. They show the immaturity of this experimental process, but they hold out a reasonable expectation that the object will be attained eventually with an artist-like perfection. The "héliographie" of M. Niépce de Saint-Victor is attracting to the experimental instructions of this remarkable man (nephew of Daguerre) numerous enthusiastic disciples. Without attempting to

Photographic engraving.

Mr. Knight on Drawing, Printing, &c.

describe the process technically, I will briefly state what I, in company with some of my fellow-jurors, saw the inventor perform in his official apartments as Governor of the Louvre. He took a highly-polished steel plate, four inches by three, upon which he poured a varnish, which covered it so thinly that it could scarcely be perceived. We then went to the other side of the Louvre for the advantage of the south aspect. The day was somewhat cloudy. Upon the steel plate M. Niépce placed "the negative" in the ordinary way. In about ten minutes the transfer was made to the plate. No trace of the sun-engraving could, however, be seen until the plate was acted upon by another fluid. The copy then was perfect. The bituminous varnish had been removed by the sun in all the light parts of the picture. It remained on the dark parts to furnish an etching with a peculiar acid, whose action is resisted by the same varnish that was so quickly decomposed by the light. The same result is produced by placing the varnished steel in the camera. The process of M. Niépce is fully described in his "Recherches Photographiques," 1855. That sun-engraving on steel is rapidly passing out of the experimental stage is abundantly shown by specimens of engravings so produced in the Paris Exhibition. M. & Madame Riffaut have devoted themselves to this process, and exhibit three engravings, one of which is an admirable portrait of the Emperor. M. Charles Nègre is also a heliographic engraver. M. Benj. Delessert has thus produced bold and most useful copies of some of the engravings of Marc Antonio. The art has been applied to natural history in the "Photographie Zoologique" of M. Louis Rousseau. M. Niépce's "Recherches" are accompanied by an admirable portrait of the author. In the memoir of M. Niépce, prefixed to his work by M. Chevreuil, the writer says—and I believe his prediction is not altogether vain—"a day will come when the historian, the traveller, and the naturalist will entrust the illustration of their books solely to the heliographic engravers."

In submitting to your Lordship these imperfect remarks upon some of the objects that arrested my attention in the Paris Exhibition, I have confined myself chiefly to those sections of my class which belong to printing, or have a direct association with the same principle of multiplying copies. The art of bookbinding, though essentially connected with the objects upon which I have touched, and as affording also valuable indications of the nature of the demand for books in various countries, does not appear to me to call for any details on my part.

Tendency of the printing arts to the union of excellence and cheapness.

In conclusion, I would observe that, in all the arts that belong to typography, or are associated with it, the tendency of the various discoveries and improvements of modern times has been to attain a higher excellence in combination with a lower price. The printing-machine is being perfected, so as to produce something better, as well as cheaper, than hand labour. The electro processes applied to printing have the same tendency. They have extended the range of typography, as in nature-printing, and they have improved its old methods. When we have obtained an electrotype from a woodcut, we have something better than the original. We have a copy which will not wear so quickly, and we can produce other copies from the unprinted block. This multiplication of copies was done by stereotyping; but the copy in type-metal was necessarily inferior to an electrotype. The mechanical applications of colour in printing, whether typography or lithography, have produced incalculable advantages for art and science, which need no illustration. One fact, however, of the extension of the demand for a publication of the highest importance in scientific inquiry, by the mechanical application of colour, is too remarkable to be passed over. The beautiful geological map of France issued by the Government, — "Tableau d'Assemblage de la Carte Géologique de la France,"—was originally coloured by hand; it was sold for 21 francs, and the entire sale never reached 250 copies. The Directors of the Government Printing-office determined, large as the map is, to make the bold attempt to colour it by lithography. Twenty-three colouring stones, besides the outline stone, were necessary to effect this. After two years' experiment, the map thus produced by twenty-four different impressions, was published for $3\frac{1}{2}$ francs—one-sixth of the price of the hand-coloured map. In five years 3,000 copies have been sold. It is impossible to over-estimate the benefit to the industrial resources of France by the power thus conferred upon the agriculturist, the miner, and even the humblest excavator, of studying the structure of the earth upon which they labour.

I have the honour to be, &c.

Charles Knight.

London, 14th Feb. 1856.

On the XIIIth Class, as far as relates to Military Art.—By Francis Fowke, Captain, Royal Engineers.

To the Right Hon. the Lord Stanley of Alderley, President of the Board of Trade, &c., &c.

My Lord,

Agreeably to your instructions, I have the honour to lay before you the following report on the Military Arts as represented in the Paris Universal Exhibition.

The Subdivision of the XIIIth Class, which treats of Military Art and Science, contains five Sections, which are numbered and designated as follows:—

Section VI.—*Military Engineering.*

Classification.

Plans and systems of the attack and defence of fortresses.
Models and drawings of field fortification, and of machines employed in the attack and defence of works.
Models of fortified places and permanent fortifications.
Plans in relief and models relating to topography, topographic and geographic maps.

Section VII.—*Military Materiel and Equipment.*

Articles relating to encampment, tents, canteens, beds, cooking apparatus, ovens, &c.
Travelling appliances, military carriages and means of transport, waggons, ambulances, tumbrels, &c.
Stores and machines for the extinction of fires, and safety apparatus.
Military bridges, pontoons, rafts, bridges of boats, rope bridges, &c.

Section VIII.—*Equipment of Troops.*

Clothing and equipment of infantry.
Clothing and equipment of cavalry.
Clothing and equipment of naval forces.
Saddles, harness, and caparisons for animals both for draught and carrying.

Section IX.—*Arms and Projectiles.*

Material relating to the manufacture of arms and projectiles.
Defensive arms, shields, cuirasses, helmets, armour, blunt arms, such as maces.

Capt. Fowke on Military Art.

Trenchant and steel arms, sabres, swords, lances, bayonets, axes, &c.
Bows, crossbows, slings, &c.
Muskets, carbines, rifles, pistols for armament of troops musket and rifle balls, &c.
Sporting arms, tools, and accessories.
Cannons, guns, howitzers, mortars, shot, shell, &c.

Section X.—*Pyrotechny (where it can be exhibited without danger).*

Workshop materials for pyrotechny.
Raw materials prepared for the manufacture of powder.
Gunpowder for war, sporting, and mining purposes.
Detonating powders and caps.
Cartridges and accessories for arms of all calibres.
Fireworks for military purposes.
Fireworks for occasions of rejoicing.

Thus embracing not only such subjects as are purely military, but also many things that are but indirectly connected with the science of war, and even treating of the material and apparatus necessary for their manufacture.

Military art imperfectly represented in 1851.

It was remarked of the Great Exhibition of 1851, that while all parts of the world vied with each other in the beauty and novelty of their productions, and in the ingenuity and talent displayed in the numberless inventions and improvements in almost every branch of manufacture and construction, comparatively few objects were exhibited which belonged, strictly speaking, to the military sciences. The class in which they were included was, it is true, filled up by large contributions of fire-arms and their accessories, but these consisted chiefly of such as are used for sporting purposes, and there was almost a total absence of anything novel or interesting in objects and apparatus connected with the art of war.

Exhibition of 1851 held in time of peace.

It was argued that there appeared to have been a feeling that the object of the Great Exhibition "was rather to make known and promote the arts that add to the comforts and enjoyment of life than the destructive engines of war;" and the deficiency may, perhaps, further be accounted for by the fact of the Exhibition of 1851 having been held in a time of profound peace, with no prospect of war to awaken any consideration of military affairs, and when the public attention was drawn off from all that appertains to warfare by a period of tranquillity marked by commercial prosperity and scientific discovery unparalleled in European annals.

Tranquillity uninterrupted, or at most disturbed only by isolated contests so distant and unimportant to the general interests as to be wholly uninfluential in European politics; contests, too, in all cases with savage tribes or semi-barbarous nations, in which the ordinary arms and appliances of civilized countries, however imperfect they may now be felt to have been, were so immeasurably superior to anything that could be brought into the field by their opponents as to call for no exercise of ingenuity in devising improvements of existing arms, and in which neither the scale upon which the wars were conducted, nor the duration of the individual campaigns, were of sufficient magnitude to throw any such extra pressure on the home establishments as to demand any extraordinary activity in the transport of men and material, or modification of system of manufacture or supply.

Reasons for expecting a better representation in 1855.

The Exhibition of 1855, on the other hand, has taken place the year after the opening of a great war, undertaken by two of the most civilized nations of the world, nations distinguished alike for progress in discovery and fertility of inventive genius, in the application of science to all branches of manufacture, astonishing the world by the magnitude of their civil constructions, and the extent and excellence of their productions;—undertaken, too, against a people who, however, behindhand in the more polished arts of peace, have always shown themselves formidable opponents in war, and furthermore, possessed of unbounded energy and ability both in the invention of military appliances, and in the adoption and adaptation of such as have been from time to time introduced into the armies of other powers; and consequently calling forth all the military talent and skill of the day in a contest which, as had always been foretold of the next great European war that might occur, was to be marked as a struggle of intellect instead of brute force.

This anticipation not realized.

Under such circumstances as these, it was to be supposed that the Exhibition of 1855 would be distinguished from its predecessor by the variety and completeness of its display of objects relating to the military sciences. The direct contrary has, however, been the case, as will be seen by the catalogue of articles exhibited, where the class of military art will be found even more scantily filled than was the case in the Great Exhibition in London.

Probable reasons.

The reason of this deficiency may perhaps be found in the consideration, that while other branches of industry are carried on by private individuals or commercial associations, it is to the different state govern-

ments alone that we must look for an adequate representation of objects in this class; and that while among those engaged in commerce or manufacture a constant competition one with another is continually creating opportunities for the display of talent, and making apparent the advantages of improvements, the value of most military inventions can, on the other hand, only be properly tested and their advantages felt in time of war; it is then alone that defects in system or material make themselves known, and it is in a state of war consequently that invention is more frequently taxed to remedy such deficiencies in important discoveries thereby suggested. In the case of the former, the spirit of commercial competition or rivalry, self-interest or a desire for renown, act as powerful stimulants to induce each one to come forward with novelties and excellencies in his particular branch; but inventions or improvements in military affairs would never be likely to be extensively represented at a Universal Exhibition, as the governments of states have not the same interest in competing with one another, or in showing their superiority one over another, as is the case with private individuals. On the contrary, so far from their interests leading them to publish the advantages of their respective systems, they are naturally led to secure by secrecy the possession of any important invention which, in the case of a private individual, could be protected by means of a patent. In the case of military improvements being made by private individuals, they are almost invariably offered to their respective governments, that being the only market in which the inventor can hope to reap any benefit from his discovery, any exhibition of which would naturally lessen its value, and operate to his own disadvantage. There will always be a few exhibitors in the shape of inventors of schemes that may have been rejected by their own governments; but many of these would probably be deterred from exhibiting by the difficulty of judging of the merits of their inventions without actual trial in the field, and their consequently diminished chances of having their ingenuity appreciated, or of obtaining an award from the juries. To this may be added that (as in other branches of manufacture) the principal individuals who have, by their talents, ingenuity, or energy, contributed to the amelioration and improvement of materials pertaining to war, are those whose immediate profession leads them to the consideration of such matters, and who being, consequently, in the service of their respective governments, naturally consider that that government has the exclusive

right to deal with any invention or improvement that they may happen to make.

From the foregoing considerations, then, it would appear that in examining the contributions of the various states to the Paris Exhibition, the principal evidence of their progress, so far as regards the military sciences, must be sought for rather in such correlative and external information as can be obtained apart from the mere objects exhibited, than from any indications of advancement in their contributions under this head. The Baron Charles Dupin, to whom I am indebted for much information concerning the French military service, remarks that in the period immediately preceding the Exhibition of 1851, three improvements took place in small arms, viz., the substitution of detonating caps for the flint, the invention of a system of loading at the breach, and, thirdly, an improvement in the form of the projectile. To the same period is to be referred the great change in the system of ordnance which has been wrought by the employment of guns of large calibre throwing hollow shot and shells, more particularly in the armament of vessels of war, and consequently of their antagonists, coast batteries, and the increase generally in the weight and power of heavy artillery. The years that have elapsed since the London Exhibition have not been marked by any important military inventions; but some of those formerly introduced have now for the first time been brought into play and rendered of practical use, and principles well known in other branches of science have now for the first time been called upon to give their aid in furtherance of war. Steam has for the first time come into play on a large scale as an adjunct in military transport, and a vast army has been moved by its aid with a rapidity and ease hitherto unknown in military operations; we have seen the railway and locomotive appear for the first time in the field, and the electric telegraph now takes its place among important military apparatus.

Military inventions in first half of 19th century.

Some remarkable changes have, however, taken place, among which must be noticed the new system of field artillery invented by His Majesty Napoleon III., and introduced by him into the French service; the great principle of which is to have but one calibre for all field guns, and to suit them to the nature and requirements of the various situations in which they are to be employed by a variation of length and weight only; not the least ingenious part of the arrangement is the way in which the alteration is effected, without a single gun of the present pattern being lost or rendered obsolete.

French field artillery.

Capt. Fowke on Military Art.

Lancaster's gun.

At the same time a clever attempt has been made in the British service to substitute an elongated ball—similar in form to that found so effective in small arms—for the spherical shot in ordinary use in cannon, by means of a rifled gun, in which the elliptic form of the bore is made to serve the same purpose as the grooves in a common rifle, but its advantages have not been as yet sufficiently developed to cause any change in either the construction or system of artillery. The invention is due to Mr. Lancaster, who has applied the same principle successfully to rifles, both for the armament of troops and for sporting purposes; and it is much to be regretted that he should have chosen the part of abstaining from entering into this great competition of science and manufactures, where the merit of his invention would have been so thoroughly appreciated.

The recent improvements in rifled small-arms, which were but beginning to develop themselves at the period of the Exhibition of 1851, which have since caused such alterations in modern warfare, both in the field and in the attack and defence of fortresses, and which seem destined to reduce the relative importance even of field artillery, demand that a word should be said here on the history of the projectile which has caused such changes, and also on the description of troops which it has been the means of introducing into the armies of Europe, and more particularly into the French service.

Adoption of an elongated projectile.

The first attempt to change the form of the projectile then in use seems to have been in the year 1841, when, at the suggestion of M. Thierry, a captain in the French army, a ball of a cylindrical form, with a hemispherical termination at one end, was experimented upon, but without any apparent success. This was followed in the same year, with no better result, by a ball, the invention of a M. Delvigne, the form of which was that of an elongated ellipsoid, with a short cylinder at its base. The first decided improvement is due to Colonel Thouvenin, also a Frenchman, who turned his attention to the form of the rifle itself, and by his improvements thereon rendered available the hitherto useless inventions of his predecessors. This improvement consisted in causing the ball to expand and adapt itself to the grooved form of the barrel; and this he effected by the introduction into the bottom of the bore of a circular steel spike, round which the powder of the charge was deposited; and the ball being rammed down forcibly, was spread by the top of the spike and made to enter into the grooves of the rifle. This constitutes the principal peculiarity of the *carabine à*

tige, of which a careful series of experiments, made at Vincennes in the years 1840, 1841, and 1842, attested the undoubted superiority over the ordinary weapon both in accuracy of fire, length of range, and in penetration, and which is now extensively used in the French service.

Capt. Minié's invention;

In 1849, Captain Minié, director of the school of instruction in small-arm firing, at Vincennes, conceived the idea of making the gunpowder of the charge perform the office of the *tige* of M. Thouvenin, in spreading the ball into the grooves of the rifle; and this he proposed to effect by introducing into the ball itself a substitute for the *tige*, in the shape of a small cone of sheet iron fitting into a similarly shaped hollow in the base of the ball, the increase of which would then be affected by the cone being wedged into the hollow by the force of the explosion. From experiments made at Vincennes, it appeared that the range of this new or minié ball was considerably superior to that of a solid ball of the same external form, but that the latter had the advantage in the accuracy of its fire.

its adoption by the English.

In the English service the minié ball has been adopted, with the exception of the iron cone, more recent experience having decided against its employment.

French light troops; Zouaves.

In connection with the improvements in the military rifle, and consequent in some measure upon their adoption, may be noticed the introduction into the French army of what may be called a new arm of the service, namely, the chasseurs, or light troops, armed and drilled in a peculiar manner, and first employed in the campaigns in Algeria; the French light infantry regiments up to that time, as in our service, not having differed in either drill or equipment from the ordinary battalions of the line. The employment of such troops seems first to have been suggested to the French by the desultory and guerilla-like nature of the war which they were then waging against the Arabs of the desert, and commenced with the formation of irregular companies of natives with French officers, on a somewhat similar system to that which England had practised with such success on a larger scale in India. These men being found to be hardy, active, quick-sighted, and accustomed to act singly, were manifestly better fitted for light infantry than for the more disciplined services of the line, and being armed with the rifle, formed the original regiments of Zouaves now so well known, and bearing so high a reputation, not only for bravery, but also for endurance and other campaigning qualifications.

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Chasseurs de Vincennes.

Such was the success of the experiment, and so useful were these new troops in the African campaigns, that the idea was conceived and speedily carried out, of forming a similar force of native Frenchmen on the model of the native Zouaves. These new regiments were formed of men selected from all arms, for activity, and quickness of aim and sight, officered by the smartest and most intelligent officers of the French army, and armed with the above-mentioned *carabine à tige*, the most efficient arm that could be obtained. From the locality where they were first recruited they were termed Chasseurs de Vincennes, and so great has been the value attached to them, that they have been increased from time to time till at present, they number 20 battalions of a total strength of 17,000 men. This force is distributed through the French army in the proportion of one battalion of chasseurs to twelve battalions of the line, with which they march as a battery of field artillery, which they are said in many cases to exceed in efficiency. The drill approaches somewhat that of the rifles and light infantry in the English service; the skirmishing and rallying presenting but little difference; the formation being in two ranks instead of three, as is the French custom, and the command being given by bugle or by the officer's whistle, as with us. There are four descriptions of pace proper to the drill of the Chasseurs de Vincennes, viz. :—

	Steps per minute.		per hour.
Ordinary time	70	2ft. 2in. long, 1 mile	1,210 yards.
Quick „	110	2ft. 2in. long, 2 „	1,150 „
Double „	165	2ft. 9in. long, 5 „	150 „
Quick double time	180	2ft. 9in. long, 5 „	970 „

From which table it would appear that the step length of pace, as well as the rate of marching per hour, is somewhat less than in our service.

Maps and charts.

No maps or charts essentially of a military character were exhibited in Paris, and the Government surveys of both France and England (of which some admirable examples were contributed) have been examined by the juries of another class to which they more properly belong, but as the conduct of both is under the control of the War Departments and superintended by military corps, it may not be out of place here to enter in some measure into the system and arrangement of the particular department by which they are conducted and executed, which in the French service is known as the Dépôt de la Guerre, and in

which is vested all control of military documents, not merely topographic, but also historic, geographic, and statistic.

Organization of the Depôt de la Guerre.

This department is under the direction of the Minister of War, and is presided over by a general officer who is named Director, and who corresponds directly with the Minister himself. It is divided into two sections, the first of which corresponds in some measure with our Ordnance Survey Department, and is charged with the execution, drawing, and engraving of the great maps of France and Algeria. The second section is occupied in the collection and keeping of historic records and information on military statistics.

Staff.

The first or survey section consists of a staff of officers, assisted by civil draughtsmen in the following proportion; viz., 46 officers, and 56 civilians. Of these there are 16 superior officers, 6 of whom are employed at head-quarters, and 10 superintending the work in the field; the remaining 30 officers who are of the rank of captains and lieutenants, are all employed in the field. The civil branch is divided into 3 clerks, 28 draughtsmen, and 25 engravers.

Military officers.

The officers are all selected from the corps d'Etat Major, (the principal duties of which are performed in the English service by the corps of Royal Engineers), and those employed in the field receive an extra pay of five francs a day, in consideration of the extra expenses to which they are liable in moving frequently from place to place in the exercise of their duties. They are distributed in brigades of from four to eight captains or subalterns, each brigade being commanded by a superior officer; these brigades are not only employed in the survey of France, but are attached to every army in the field.

Civilians.

The civil staff is divided into different classes according to their ability and the quality of their work, and are paid from 64*l.* to 144*l.* per annum; in addition to these, there are pupils or apprentices who receive a payment of 24*l.* a year, and a number of engravers who are employed in executing the plates of the great map of France by contract, or piece-work, the price of which is fixed separately in each particular instance by a committee of geographic works. In this section a separate office takes charge of the correspondence of the direction.

The second section comprises a department which has no parallel in the British service; it consists as in the former case of a mixed military and civil staff of 11 superior officers, who are always employed at the depôt, and 14 civilians; viz., 2 draughtsmen and painters of battles and 12 clerks.

Duties.

Its duties are classed under five heads, or subsections as follows:—

1. Military statistics.
2. Military archives.
3. Historical memoirs.
4. Maps and charts, both engraved and hand-drawn.
5. A library.

Military Statistics.

The subsection of military statistics comprises military reconnaissances, giving the description of ground, and information concerning the strength and military organization of foreign countries, obtained in some cases from published documents, and when these could not be had, by information collected either by officers sent specially for the purpose or through the various consular agents of France, who were charged to make a particular study of the military resources of the localities in which they might happen to be placed.

Military archives.

The subsection of military archives has for its object the collection and preservation of all orders emanating from heads of departments, whether from the minister, commander-in-chief, general officers, &c., of all reports or descriptions of military operations, and of all official correspondence either in time of war, or concerning warlike affairs.

The chief of the staff and his subordinate chiefs in each division of the army, are obliged to keep copies of every letter or order written or received during war, and these being transmitted to the Dépôt de la Guerre, are properly classed and arranged at the cessation of hostilities, and form an interesting and important official history. The collection of such documents is much facilitated by a law which gives the State the right of examining the papers of any employé, civil or military, at his decease, and of selecting and keeping such of them as may appear in any way useful to the public service.

Historical memoirs.

The third subsection is that of historical military memoirs. The officers attached to the Dépôt de la Guerre, having access to all the official documents concerning the different wars in which France has been from time to time engaged, are employed in their historical collection and compilation; each part when completed being bound up separately under the head of the particular war, and army to which it refers, and the whole forming a grand historical military memoir of the nation. Many generals have themselves undertaken the task of adding to these official documents a general memoir of the campaigns in which they have been engaged;

and this national work now comprises the complete military history of France from the year 1735 to the present time, and consists of nearly 300 volumes, besides upwards of 100 large portfolios of documents not yet sufficiently complete to be added to the list of those thus bound up.

Maps and charts.

In the fourth subsection, viz., the depôt of military maps, are found all the maps, charts, plans of battles, &c., illustrative of the above-mentioned archives and memoirs; as also many others of different countries, containing information purely topographical or geographical. Lastly, we come to the library, which forms the fifth subdivision of this section of the Dépôt de la Guerre, and which contains not only works purely military, but has also a rich collection of all works treating of the general histories of both France and of all the other countries of the world.

Library.

This, with a separate office for the conduct of its financial affairs and the correspondence, completes the second section of the Dépôt de la Guerre.

Electrotyping.

It should be mentioned that an electrotyping branch has within the last three years been added to the survey department, and that it is at present in contemplation to create also a corps of photographers, for the service of the same work.

Annual expenditure.

The annual estimate for the maintenance of this department of the war-office is as follows:—

	£
Printing of maps and memoirs . . .	740
Extra work in drawing, purchase of maps, books, instruments, copper, &c. . .	360
Surveying works, cost of signals, stations, &c. .	1,084
Allowance for extra expenses incurred by commanders of brigades in the field . .	144
Cost of engraving, binding, &c. . . .	3,000
Total	5,328

To this must be added the expenses of the central administration, the salaries—the civil branch from 5,000*l.* to 6,000*l.*, and the pay of the officers from 6,000*l.* to 7,000*l.*—as also the cost of keeping the offices, lighting, warming, servants, &c., which altogether will bring up the expenditure of the Dépôt de la Guerre to not less than 20,000*l.*

Depôt des Fortifications;

This department does not include the plans and documents relative to the duties of the Corps du Génie, which are contained in a separate branch called the Dépôt des Fortifications, also divided into two sections, the first containing all

documents written or printed, and the second the plans and maps to which these documents refer.

This matériel is classed as follows:—

its subdivisions.

SECTION 1.—*Documents, &c.*

1. Fortifications of France, memoirs, projects, letters, &c.
2. Military buildings of all kinds.
3. Inventions and papers concerning the state of repair, &c.
4. Frontiers of France, information, &c.
5. Information concerning foreign fortresses.
6. Objects of art.
7. Journals of sieges and campaigns.
8. Relating to the service and administration of the Corps du Génie.
9. Estimates, specifications, agreements, contracts.
10. Expenditure on fortresses, military buildings, &c.
11. Appropriation of land.
12. Permission to build.
13. Ancient archives relating to fortifications.

SECTION 2.—*Portfolios and Charts.*

1. Geography, maps.
2. Topograpy, directions, and maps.
3. Topography of frontiers.
4. Plans of sieges, campaigns, seats of war, marches of armies, &c.
5. Drawings and studies of works of art.
6. Plans of fortresses—French.
7. Plans of fortresses—foreign.
8. Atlases, terrestrial and marine.
9. Do. of France and of the military positions.

Library.

The Dépôt de Fortifications has also a library of some 20,000 volumes, totally distinct from that before mentioned as belonging to the Dépôt de la Guerre, and devoted to—

1. Annals and histories pertaining to fortification and military matters generally.
2. Works relating to sciences and arts.
3. History, geography, travels, and voyages.
4. General literature.
5. Periodicals.
6. Bound-up manuscripts on the science of fortification, and on frontiers and fortresses.

This department is entirely conducted by the officers of the Engineers or Corps du Génie, and, as mentioned above, is totally distinct from the Dépôt de la Guerre.

The differences that exist between the military systems of France and England are now so well known, in consequence of the intimate relations at present existing between the armies of the two countries in the field, that any remark or description would be here quite superfluous; it therefore merely remains to examine in detail the various objects in this class that are actually contained in the Exhibition; and in doing so, it will perhaps be better to notice the subjects in the order of their relative importance and their connection with one another, rather than to follow exactly the order in which they are enumerated in the system of classification adopted by the Imperial Commission.

Cannon.

Cannon.

This most important of all military arms and appliances is but indifferently represented in the Paris Exhibition, the French Ministers of War and Marine and the Belgian Government Foundry at Liege being almost the only exhibitors. A few other cannon may be found scattered over different parts of the Exhibition, but seem, almost without exception, to be exhibited as specimens of the quality of the metal of which they are composed, or to exemplify some particular excellence in casting or forging, rather than for any novelty either in the form or principle of the guns, or peculiarity in their system of loading or manœuvring.

Field artillery invented by the Emperor.

As exceptions to this rule must be noticed, however, the system of field artillery invented by His Majesty the Emperor Napoleon III., and introduced by him in the French service, the main feature in which consists in assimilating the calibres of the different guns and howitzers used in the field, which is accomplished in the following manner. The French field artillery consisted of two descriptions of gun, viz., an 8-pounder and a 12-pounder; the 8-pounder is now bored up to a light 12-pounder howitzer, weighing 9 cwt. 3 qrs. 18 lbs., for service with cavalry, with a charge of 2·2 lbs of powder for shot and shell; a new 12-pounder is introduced for service with infantry, weighing 12 cwt. 0 qrs. 20 lbs., and with a charge of 3 lbs. of powder for shot and 2·2 lbs. for shell; and, finally, the old 12-pounder gun is retained and appropriated to the reserves.

Swedish breech-loading gun.

A second exception may be mentioned in the breech-loading gun invented by M. Wahrendorf, and adopted in the Swedish artillery, which, however, does not appear to differ in any particular from that exhibited by him in London in 1851. A model of the same gun is shown mounted on a short traversing platform of peculiar construction, suitable for a casemate or a blinded embrasure.

An iron field-piece also forms part of the Swedish contribution, which in proportion to its somewhat greater length and calibre, does not appear to exceed in weight the ordinary brass light six-pounder; the field carriage and limber on which it is mounted appear rather heavier than those of the French artillery, which they much resemble, but do not seem to possess any point worthy of remark.

Guns cast in sand,

Two brass 12-pounders, exhibited by the French Minister of Marine, have been moulded and cast in sand instead of in clay, the result of a series of experiments which were instituted and continued for some years at the foundry of Ruelle. This method, which has now been definitively adopted by the French marine, is said to possess the merit of considerable economy in the moulding, less chance of failure in casting, and that it is not necessary to leave so great a thickness of metal to be turned off after it has been

not turned.

removed from the mould; in fact, one of the guns in question is shown with its exterior in the state in which it has left the sand, that is, without having been turned or chased, and with all its rings, fillets, trunnions, ornaments, &c. finished in the casting. The advantages claimed are an economy of more than 8*l.* in a single gun, and, what is of greater consequence, a considerable saving of time where it is required to get ready a large number of guns in a limited time, the only operations necessary after casting being the boring and cutting off the dead head of metal.

The remainder of the French guns are merely a collection of those commonly in use in their artillery, and do not differ in any material point from our own.

Belgian guns (iron), not turned.

The cannon exhibited by the Belgian foundry at Liege are all iron, and are in most cases not turned on the outside. Some of them seem to depart very much from our ideas of symmetry and proportion, differ from English ordnance in not having the great thickness of metal continued to the trunnions, and being very thin at the second reinforce, that part which we have been taught by experience is the usual point of fracture in cases of guns bursting.

Each gun is accompanied by a statement of the proof to which it has been submitted, and of which the following is a copy.

Proof of Belgian guns.

GUNS EXHIBITED.

No. 1.—24-pounder iron gun, not turned on the outside, weight 5,451·6 lbs.

Proof:

15 rounds with 13·2 lbs. powder, 2 round shot, 1 wad.
5 „ 17·6 „ 2 to 3 round shot, 1 wad.
16 „ 6·6 „ 2 to 17 round shot, 2 wads.
Total, 36 rounds.

No. 2.—8-inch howitzer (iron), weight 5,464·8 lbs., not turned on the outside.

Proof:

15 rounds with 8·25 lbs. powder, 2 round shot, 2 wads.
5 „ 8·25 „ 1 „ 2 „
64 „ 8·8 to 19·25 lbs. powder, 1 to 8 round shot, 2 wads.
Total, 84 rounds.

No. 3.—60-pounder iron howitzer, weight 6,210·6 lbs., not turned on the outside.

Proof:

500 rounds with 7·7 lbs. powder, 1 shell, 0 wad.
135 „ 4·4 to 6·6 lbs. powder, 1 shrapnel shell, 0 wad.
48 „ 6·6 lbs. powder, 1 case shot, 0 wad.
Total, 683 rounds.

No. 4.—24-pounder, short iron gun, weight 1,980 lbs., turned on the outside.

Proof:

1,280 rounds with 0·55 to 0·935 lbs. powder, 1 round shot, 0 wad; ricochet practice.
2,070 rounds with 4·4 lbs. powder, 1 shell, 5·89 inch, 0 wad; dismounting practice.
54 rounds with 4·4 lbs. powder, 1 shrapnel shell, 5·5 inch, 0 wad; dismounting practice.
245 rounds with 2·2 to 5·5 lbs. powder, 1 shot, shell or shrapnel, 0 wad, dismounting practice.
Total, 3,649 rounds.

No. 5.—Light 6-pounder iron gun, weight 1,221 lbs., not turned on the outside.

Proof:

10 rounds with 2·2 lbs. powder, 1 shot, 2 wads.
10 „ 2·2 „ 2 „ 2 „
10 „ 3·3 „ 3 „ 2 „
10 „ 3·96 „ 4 „ 2 „
5 „ 2·2 „ 1 „ 2 „
Total, 45 rounds.

No. 6.—Light 24-pounder iron gun, weight 3,841 lbs. not turned on the outside.

Proof:

2 rounds with 4·4 lbs. powder, 1 shot, 2 wads.
2,000 „ 6·6 „ 2 „ 2 „
Total, 2,002 rounds.

No. 7.—Garrison gun, iron 6-pounder, weight 1,949 lbs., not turned on the outside.

Proof:

2 rounds with 3·3 lbs. powder, 2 round shot, 2 wads.
6,000 „ 2·2 „ 1 „ 2 „
Total, 6,002 rounds.

No. 8.—Garrison 24-pounder iron gun, weight 3,674 lbs., not turned on the outside.

Proof:

2 rounds with 6·6 lbs. powder, 2 round shot, 2 wads.
17 „ 4·4 lbs. to 22·0 lbs. powder, 1 shot, 2 wads.
12 „ 4·4 lbs. to 8·8 lbs. powder, 2 to 12 shot, 2 wads.
Total, 31 rounds.

No. 9.—Iron 6-inch field howitzer, weight 1,144 lbs. turned on the outside.

Proof:

2,107 rounds with 2·2 lbs. powder, 1 shell.
3 „ 2·2 „ 1 round shot.
3 „ 2·2 „ 1 shell.
3 „ 3·3 „ 1 round shot.
Total, 2,116 rounds.

Wrought iron gun.

A small wrought iron gun, apparently a light six-pounder, in the collection of specimens of iron exhibited by the iron trade of Great Britain, does not offer any novelty either in form or material (unless wrought iron can be termed novel in its application to the fabrication of ordnance), but appears to be exhibited merely as a specimen of iron forging. The same remark applies to a wrought iron mortar exhibited in she part of the building occupied by French goods of the tame class, and which appears to differ but little, if at all, from the 10-inch land-service mortar at present in use. A wrought and cast iron gun-carriage, in the same department, is of the ordinary French pattern, being also merely shown as a specimen of iron work, and not in reference to its merits in a military point of view. In the same part of the Exhibition are shown some cast steel cuirasses, said to be lighter, with the same capability of resistance, than any that have before been manufactured, and which bear the marks of the firing by which they have been tested.

A portion of the breech of a brass gun in the Sardinian department is exhibited for the purpose of showing an invention which, if capable of being applied in practice, appears deserving of interest. It consists of a moveable vent, capable of being replaced in the field.

Sardinian moveable vent.

The moveable vent, or rather moveable bouching, consists of a copper bolt about an inch in diameter, which is introduced into a hole of the same size from the interior of the gun, the head of the bolt fitting into a hollow in the bore.

which is countersunk to receive it. The head being held in its place by an iron tool, the end of the bolt is riveted on the outside, so that to rebouch the gun nothing more is necessary than to knock up the rivet, drive the bolt or bouching into the gun, when it can be taken out by the muzzle, and a new one introduced in a similar manner.

Breech-loading guns.

One or two small models of breech-loading cannon are exhibited in the French department, which, however, do not go beyond the usual combinations of screws, levers, and wedges which have been so often tried, and as often laid aside. In one small model the trunnion, instead of being secured in a round hole, is allowed to recoil in a longitudinal slot in the upper part of the cheek of the carriage, and a kind of bent rammer is used, having a rod parallel to the rammer and attached to it outside the gun, so that a man standing in rear of the gun can ram home; but there does not appear to be a single cannon exhibited either possessing any practical novelty, or affording anything suggestive of improvement.

French coast-battery carriage.

The same remark may be made with respect to gun-carriages, only two of which appear to differ from those in our own service. One is a French coast-battery carriage and traversing platform for an 8-inch howitzer. It is of cast-iron, extremely heavy and clumsy in appearance. Its peculiarity consists in the gun-carriage being supported on the traversing platform at three points instead of four; the front of the carriage is supported on two small trucks or wheels, having flanges outside of sufficient width to admit of holes being cast in their circumference for the insertion of a handspike; the cheeks of the traversing platform are merely of sufficient length to allow for the recoil of these wheels; the trail of the gun-carriage is on a slide, notched or dovetailed on to a centre bar of the traversing platform, which projects five feet beyond the cheeks to provide for the recoil of the slide. The length of the platform is ten feet by three feet six inches in width; the pivot is in a solid breast transom immediately under the position which trunnions occupy when the gun is run up. This pivot bears the entire weight of the front of the platform and carriage, as there are no front trucks to the former, it has two behind of about sixteen inches in diameter.

Swedish traversing platform.

A Swedish cast-iron traversing platform seems, on the contrary, to fall into the extreme of too great lightness, and the trucks seem inconveniently large, those in rear being two feet in diameter; a short handspike is attached to each of them, by which they can be moved in traversing. The

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inclination or gradient of the traversing platform is extremely steep, and would seem liable to offer so much resistance to the recoil of the gun as to be injurious to the pivot, which latter is in front, and is attached to the traversing platform by a wrought iron bridle. There is a small truck attached to the rear of the gun-carriage by an iron strap working on a horizontal pivot. A small horn projects from the gun-carriage over this strap, and in running the gun up an ordinary handspike inserted under the horn, and above the strap of the truck, and pressed down, throws at once the weight of the carriage on the truck, and serves the same end as the roller handspike and its subsequent modifications in use in the English service.

Small Arms.

Small arms, principally Belgian.

Among the varieties of small arms displayed in the Exhibition, by far the greater number are exhibited by Belgium. France also sends a large quantity. The English show of arms falls far short of representing the value or importance of this branch of her manufacture; and the remaining nations cannot be said to have sent any collection of the produce of this trade, but are merely represented by a very few and in most cases unimportant exhibitors.

French arms distinguished for ornament.

France is distinguished for the beauty of art-work in her well-named "arms of luxury," which, as she says, "defy all competition for the exquisite arrangement of their ornamentation, the grace of their forms, and the ability of the designers, engravers, carvers, sculptors, &c. who have been employed in their execution." In fact, so great importance is put upon this qualification (by us considered wholly secondary and non-essential), that in awarding the grande médaille d'honneur to the gunmaking trade of Paris, the Jury on Arms particularly remark that the award is, first, for their artistic taste, and, secondly, for the quality of their arms; and of the twelve first-class medals awarded to French workmen in this class, ten are given to sculptors, designers, carvers, and decorators, while only two are reserved for actual gunmakers.

Ingenious mechanism.

Another striking point in connexion with the French show of small-arms is the extraordinary amount of mechanical ingenuity displayed in the numberless contrivances for facilitating the use or avoiding the danger of fire-arms, whether displayed in the breech-loading, self-priming, or no-priming guns, ingenious systems of cartridges, or safety catches and triggers, and to so great an extent does this appear that there are but few gunmakers who seem content

to stand simply as the maker of a perfect gun of the pattern in ordinary use, by far the greater number exhibiting more as the inventors of novelties or improvements than as mere manufacturers.

Belgian arms remarkable for cheapness.

In Belgium, on the contrary, we find with few exceptions an adherence to existing patterns, the principal houses pinning their reputation more on the extent and importance of their fabrication, the greatness of their resources by which they are enabled to furnish warlike arms in large quantities, and at reduced prices, throwing "armes de luxe," into the second place, and almost entirely discarding any attempt either at novelty of construction or superfluity of decoration. Thus we find the gunmaking industry of Liege receiving the grande médaille d'honneur not for the decoration of "armes de luxe," but for the importance and quality of the produce of its manufacture of arms of all kinds, accompanied by a remark on its ability to supply other states with arms of war, and on the advantageous position it occupies in foreign markets as maker of arms of all kinds for exportation.

In fact, from the great quantity of small-arms exhibited, the collections of the patterns in use in the armies of all the principal European States, with the prices at which they can be supplied attached, and the numbers of samples of all sorts of rifles, muskets, fowling-pieces, revolvers, &c. exhibited as made for exportation, Belgium would appear to claim the important position of being the great fire-arm mart for the rest of Europe.

England remarkable for simplicity and absence of ornament.

In the few arms exhibited by English gunmakers we find a rigid adherence to the principles of utility, an absence of all superfluous ornamentation in sporting arms, more marked even than in those of Belgium; no introduction of new system, but a tendency to simplify existing patterns and a desire to perfect and render practicable some of the novelties which have from time to time been introduced into the construction of fire-arms.

American arms.

The only other exhibition of small arms that seems deserving of any particular notice is that from the United States, which is devoted entirely to rifles and pistols on the revolving principle.

Ornamentation of arms.

Considering the question of ornamentation of arms abstractedly as art work, there is perhaps nothing of the kind in the Exhibition that is superior to some of the curiously shaped but richly decorated matchlocks and muskets in the contributions of the East India Company and several of the native princes of India; they are remarkable for beauty

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of their inlay and the colour and brilliancy of the enamel with which they are decorated, but can hardly be said to enter into competition, as arms, with the more severe but less gorgeous European models.

Indian arms.

Among them may be mentioned more especially two long muskets or firelocks, the stocks of which are richly covered with beautiful rose enamel, and the barrels inlaid with gold, exhibited by the Maharajah of Jyepore; also some matchlocks from Lahore and from other native princes of India, all vieing with each other in richness of ornamentation, but hardly coming within the province of a jury on fire-arms.

Algerian and Turkish.

Almost in the same category may be classed the Algerian and Turkish collections of arms, which latter contains some good examples of Damascus work and gold incrustation.

Spanish.

Some guns exhibited by M. Zuloaga, of Madrid, enter more strictly into the class of ornamental European gunsmith's work; of their merits as arms there is no opportunity of judging, but for the excellence of their designs and the execution of the gold incrustation and chiselling in metal, with which they are profusely decorated, they are most remarkable.

French arms.

Among the French ornamental arms there are a rifle and pair of pistols made for the Viceroy of Egypt by Gastine Renette, brilliant with gold and jewels; also a fowling-piece ordered by the Emperor, the stock of which has some well-chased arabesques in gold.

Gauvin, Caron, Flobert, Lepage, and many other Paris gunmakers, also show guns covered with chiselling, wood-carving, inlaying, and damascene work.

Raick and Son, of Liege, are almost the only Belgian makers who exhibit ornamental arms; they show two fowling-pieces with inlay and carved stocks.

French breech-loading fowling-pieces.

The French have made a very remarkable advance in sporting arms, in almost entirely abandoning the old system of loading at the muzzle, and adopting in its place what is commonly known on the Continent as the system Lefaucheux. This simple and efficacious method has been employed by all sportsmen in France and Belgium for some years, but is almost unknown in England. Mr. Lang, of Cockspur Street, however, exhibited a gun on this principle at Paris, which, in the simplicity of its mechanism and the less liability to get out of order, is a decided improvement on the original invention, and seems likely to come into use in this country.

Systéme Lefaucheux.

The system Lefaucheux has the barrel (or barrels, as the guns are generally made double-barrelled) attached to the

stock by a transverse horizontal pivot, at about eight inches from the breech end of the barrel. The barrel is open from end to end, and the breech, instead of being on the barrel, is attached to the stock; an iron loop projects downwards from the breech end of the barrel, and is secured in its place by a bolt in the stock being pressed into this loop on turning a lever under the fore-hand of the gun. To load the gun (which is done at the military position of "ready") the lever is turned on one side, which allows the point of the barrel to fall, and consequently raises the other end clear of the breech; a cartridge of a peculiar form is then introduced by the hand into each barrel; the point of the barrel is then raised to its proper position, and the lever being brought back to its place, the gun is ready to fire, no capping or priming of any kind being necessary. The peculiar cartridge mentioned above as necessary for this arm, has a metal cap or breech at the end for the purpose of preventing any escape of gas by the breech of the gun, and is ignited by a spike or needle acting on fulminating powder in its interior; this spike projects in a transverse direction from the breech-end of the cartridge, and when in the gun protrudes through a small aperture left for this purpose between the barrel and breech. This gun has been in use some years, and seems to succeed perfectly as a fowling-piece, and I cannot hear of any instance in which a person who has used it has returned to the old system.

Forget's gun.

Such is the system Lefaucheux, and the greater number of the arms exhibited by the French gunmakers are either wholly on this system or present but trifling modifications of the same. One gunmaker, for instance, Forget, has a gun which is so constructed as to be loaded either on this plan or in the ordinary way; the advantage claimed being that, in case of not being able to obtain cartridges, powder and shot can be used. In one of the guns exhibited by this maker a rifle barrel of small bore is capable of being introduced into the interior of the smooth bore, so as to make the gun serve either purpose; the idea is ingenious, but of doubtful practicability. The same exhibitor shows two percussion shells, of which the short description given is not sufficiently clear to admit of an opinion being formed; it is not stated, moreover, that they have been submitted to any actual trial.

Béssières' self-priming guns.

A system of self-priming, invented by a M. Béssières, of Paris, possesses the advantage of being simple, and capable of being applied to an ordinary fire-arm, without any alteration of lock or nipple, and that in case of its getting out of order

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the gun may be capped in the ordinary manner. It consists of a small tube, capable of containing fifty ordinary caps, which are forced onwards by a small spring behind, and by a very simple piece of mechanism the foremost cap is removed from the tube to the nipple by the mere action of cocking the piece; a small metal partition is at the same time introduced between this and the remaining caps, so as to preclude all danger of ignition or damp to the latter. This invention is shown attached to a fowling-piece and also to an ordinary French pattern musket, the only difference being that in the one case the cap tube is beneath, and in the other at the side of the barrel.

Pidault's self-adjusting rifle sight.

The principle by which the soldier is now taught to form an approximate estimate of his distance in rifle firing, viz., by the comparison of the size of an object close at hand, such as the end of his barrel or ramrod, with the average height of a man at a distance, is prettily carried out in a self-adjusting rifle-sight invented by a M. Pidault. The sight employed is of the common shape, capable of being raised or lowered in the ordinary way, on a pivot at its base, at which point it is connected with a small limb, nearly at right angles to the sight, and lying along the right side of the barrel; above this limb, and projecting from the barrel, is a small knob of metal, and an aperture is left between this projection and the limb, which aperture is increased or diminished as the sight is lowered or raised. The method of using it is as follows: the soldier, putting his piece to his shoulder, has merely to look through the aperture above mentioned at a man of average height, to open or shut it till it is exactly of the size to admit the entire figure from head to foot, and the mere action of doing so lowers or raises the sight to the proper elevation; the distance can likewise be read off, if desired, on a small scale affixed to the sight. This form of sight is extremely simple in construction, and does not seem at all more likely to get out of order than that now in use. It is exhibited attached to a rifle loading at the breech and self-priming, on something of the needle principle.

Flobert's System.

M. Flobert, 3, Rue Racin, Paris, is the inventor and exhibitor of another system of breech-loading arms, which bears his name, and is well known in France, though never, I think, introduced into England; its peculiarity consists in that, instead of having a breech attached to the stock, as in Lefaucheux method, the barrel is perfectly open, and the cock itself forms the breech, only closing the end of the barrel at the moment of its being fired; the cartridge used

is a large copper cap of the same size as the bore of the piece, and having its open end filled by the ball, which is thus propelled by the action of the fulminating powder only; a certain space is left vacant between the powder and ball to permit the gas to develope itself and to prevent the copper cap from bursting; the butt-end of the cap has a small enlargement, to hold it firmly up to the breech-end of the barrel; a small projecting piece across the face of the hammer fitting into two notches on either side of the end of the barrel insures a more certain ignition, and these notches facilitate the removal of the cartridge after discharge; in loading it is only necessary to cock the piece and introduce the cartridge. Rifles, pistols, and a revolver are shown on this system, for which the inventor claims simplicity, economy in the number of parts, the employment of cartridges which cannot injure by wet, quickness in loading, and that the force of the blow of the hammer itself contributes to the length of range; it does not appear, however, to be applicable to any arms but those of small bore and short range, viz., from 80 to 100 yards, although the inventor suggests the possibility of augmenting the force of the charge by the introduction of a small charge of ordinary gunpowder into the empty part of the cartridge. This arm has the serious disadvantage that it cannot be fired but with its peculiar and expensive cartridge, without which it is absolutely useless.

Guerin's and Briand's safety locks.

In a gun exhibited by a M. Guerin, a small safety pin or catch is introduced into the lock, which prevents the hammer from falling, and the piece consequently from going off. This catch is withdrawn by the natural pressure of the hand on the loop of the trigger-guard in the act of firing; two conditions have thus to be fulfilled before the gun can go off, and the chances of accident are of course diminished. Another exhibitor has an application of the same principle, in which the pressure is exercised by the thumb on top of the stock.

An ingenious but complicated safety arm is also exhibited by a gunmaker named Briand, in which the pressure of the shoulder on the heel of the butt is necessary for the release of the catch; and to prevent any accident from pressure on the foot or on a stone in loading, a small pendulum or plummet in the interior of the stock is so arranged that the gun cannot go off when in a perpendicular position.

M. Hovillard-Blanchard exposes fowling-pieces in which the barrels are lined with platinum, so as to render them inoxydisable, also a safety hammer which cannot be cocked

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without pressing the trigger, which appears the most practical of any of the safety apparatus exhibited. A breech-loading rifle, invented by a M. Perrin is somewhat similar to that of Lefaucheux, but presents the additional advantage of not requiring a special cartridge. The operation of throwing the barrel in and out of its place for the purpose of loading is also simple. The barrel is thrown up or made "basculer" by the movement of a sort of trigger in front of the guard, and returns to its place by a simple pressure of the hand. He also shows a duck-gun with three barrels, all of which are ignited simultaneously.

M. Claudin exhibits a modification of the system Lefaucheux, affording facilities for dismounting the barrels. He is likewise the inventor of a method of loading this gun at the muzzle, in case of the supply of cartridges failing, by the introduction at the breech of a small tube with a nipple attached.

A cartridge with the detonating powder inside, on the needle-gun principle, is shown by Berger, of St. Etienne, who also exhibits a hollow metal gunstock, which, however, does not appear to offer any advantages.

M. Prelat exhibits a revolver which loads at the rear end of the revolving breech, on the Lefaucheux system, the advantage of which is, however, not evident, as it does not appear that it can be loaded more rapidly than the ordinary revolver, and it necessitates having two joints or breaks in the barrel instead of one.

Gastine-Renette's carabine pistolet.

A very light-looking and pretty arm, which is called carabine-pistolet by the exhibitor, M. Gastine-Renette, consists of a long horse-pistol with, in addition, a very light steel skeleton stock attached, which enables it to be used either at arm's length as a pistol, or fired from the shoulder as an ordinary carabine. It would seem to be, with perhaps some slight modifications, peculiarly adapted for a light cavalry arm.

Lenoir's system of breach-loading.

In a breech-loading rifle by Lenoir, a cartridge is made use of which has the detonating powder enclosed, as in the needle-gun, but instead of being pierced by a point being protruded into the chamber, the needle is in the cartridge itself, and projects from it behind. In firing it is simply struck by a hammer in the direction of the axis of the barrel. One of the great merits seems to consist in the remarkable simplicity of the lock, which is nothing more than a single exposed steel spring in the shape of a fork, set perpendicularly in the stock; the front leg of the fork forms the hammer, and the action of cocking merely presses

the two legs together, in which position they are held by a catch till released on pulling the trigger. The disadvantages seem to be that as the cartridge is exploded by striking the projecting needle, an accidental fall or pressure seems likely to ignite it; also the grave disadvantage of a peculiar cartridge being necessary, and that the whole cartridge is lost in case of the cap missing fire; there would further appear to be a difficulty in withdrawing the cartridge under these circumstances.

M. Devisme has applied the principle of the carabine à tige to revolvers, and exhibits a pistol on this principle; and M. Chaudun shows a variety of different forms of cartridge, and also of metal bottoms for cartridges. He is the inventor of the cartridge at present in general use in almost all breech-loading guns, and exhibits a method by which persons using the Lefaucheux gun may easily make their own cartridges. A breech-tube for this description of arm has also been invented by M. Rubé, of Montdédier, in which the small projecting spike, which serves the purpose of nipple and cap, is screwed into the cartridge, and can be changed in case of its being injured without replacing the whole cartridge. This breech tube is tapped in the inside with a screw, into which can be screwed a pasteboard cartridge, so that the necessity is avoided of carrying the weight of a brass tube or bottom to each cartridge, as these tubes are capable of standing from fifty to sixty shots.

Gun-barrels.

Some very beautiful work is shown in twisted and Damascus twist barrels, perhaps the best for work being those of M. Leopold; and in one case a remarkably good pair of barrels for a double-barrelled gun forged out of one piece. There is also a pair of barrels exposed by Rouchard Siauve, of St. Etienne, in which twelve different kinds of Damascus twist are introduced, all of which correspond perfectly from one barrel to the other; another pair by Merley-Thamet, of the same place, which are stated to have been submitted to double the ordinary proof without having undergone the slightest injury.

Léroux's breech-loading rifle.

M. Léroux is the inventor of a breech-loading rifle with a magazine attached capable of containing thirty-five of Flobert's small cartridges, an ingenious piece of mechanism clears the barrel of the cartridge that has been fired and replaces it by another; he also shows a curious little instrument in the shape of a funnel, which fits on to the top of a hollow ramrod to conduct the powder in loading to the bottom of the barrel, and avoid the chance of any sticking to the sides in case of the barrel being damp or dirty by leading, &c.

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English arms.

There are but few among the fire-arms exhibited by English makers that display any novelty in principle or construction, neither do any of them lay claim to be recommended either for richness of decoration on the one hand, or lowness of price on the other, and are principally exhibited as possessing good qualities, which are not easily judged of without actual trial.

Deane and Adams's revolvers.

The principal exceptions to this rule are Messrs. Deane, Adams, and Deane's patent revolving pistol, in which the arm is cocked by the action of the trigger, so as to enable its entire number of shots to be fired without any movement of the hand; another revolver by Harvey, of Exeter, claiming strength and simplicity in its construction. Needham has a breech-loading arm, and Schlessinger another of great simplicity, also on the same principle. Greener, of Birmingham, exhibits his harpoon-gun for the whale fishery, a Mr. Hodges shows a harpoon-gun in which an ingenious application of india-rubber is made the propelling power, and Rigby, of Dublin, some Damascus twist barrels; but, as I mentioned before, the gunmaking trade of England can hardly be said to be represented.

Cheap Belgian arms.

Among the Belgian arms the most remarkable point is their extreme lowness of price. Thus we find MM. Falisse and Trapmann exhibiting a double twist barrel fowling-piece for 1*l.* 12*s.*; M. Lemille the same for 1*l.* 10*s.* 6*d.*, also a double gun, with Damascus twist barrels, for 2*l.* 13*s.*; and he will supply for 4*l.* a similar gun with a higher finish in all its parts. M. Malherbe, the inventor also of a breech-loading rifle, goes still further in this direction, and exhibits double guns with twist barrels for 1*l.* 4*s.*; others for 2*l.* 15*s.*, and with Damascus twist for 3*l.* Guns on the Lefaucheux system are sent by Jansen, of Brussels, for from 14*l.* to 18*l.* The same exhibitor has a double rifle, of which the barrels are of cast steel, and forged in a single piece. A curious four-barrelled gun is exhibited by Lepage, in which one pair of barrels is under the other, and having but two hammers for the four barrels; each hammer is articulated, so as to strike two nipples. Also, by the same house, a double gun with twist barrels for 18*s.* 6*d.*, and others at 2*l.* 15*s.*, 3*l.*, and 5*l.* Another exhibitor of the same name sells single-barrel guns from 4*s.* 6*d.* upwards, and double-barrelled for 12*s.* 10*d.*; and a M. Raik double guns at 2*l.* 8*s.*, 3*l.* 16*s.*, and 5*l.* All these arms at such extremely low prices look very well outside, but their qualities as guns could only be tested by trial, and they would of course be always looked upon with extreme suspicion.

Collette's system.

Almost the only novelty sent from Belgium is a collection

of arms by M. Collette, all capable of being discharged a great number of times without being loaded. They are on a breech-loading principle, called à glissière, and have a second or magazine barrel under the main barrel, capable of containing thirty to forty cartridges, something like those of Flobert. These two barrels have but one sliding breech, which, on being slid down, receives the cartridge from the magazine barrel, and is then slid up to the level of the real barrel to fire.

Austrian arms.

Austria sends arms by several exhibitors, some highly ornamented, but none presenting anything of interest, either in invention or improvement. Some copper caps by M. Sellier, of Prague, have the detonating powder secured by gutta percha instead of the ordinary varnish, but it does not appear that they possess any increased resistance to moisture.

Colt's revolvers.

Colonel Colt exhibits his well-known revolving rifles and pistols, but without any alteration in either form or principle from those first introduced by him into this country, his entire collection being merely repetitions one of another, and only differing in size and the material in which they are mounted.

Swords.

Swords.

There are several good collections of swords and steel arms, offensive and defensive, exhibited by different countries, and which must be subdivided, as in the case of small arms, into those which are exhibited for beauty of decoration, and those which pretend to improvement in form, or peculiar excellency in metal or manufacture; of the merits of the latter class it is of course difficult to judge from a mere inspection in an exhibition, and considerable stress must naturally be laid on the known respectability and reputation of the houses or localities where they are manufactured, and the nature of the proof to which they are said to have been submitted. On the other hand, many of the swords exhibited being mere works of art, and scarcely, if at all, coming into the category of weapons, can only be correctly judged of and properly appreciated by the jury of another class. None of the makers of swords enter into the fourth class enumerated in speaking of the small arms, that is, as claiming notice either for lowness of price, or for the importance of their manufacture as to magnitude of resource and capability for the supply of larger quantities.

Ornamental swords.

Among the "armes de luxe" may be mentioned, perhaps, in the first rank, for beauty of inlaid work and pureness of

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design, those exhibited by several of the native princes of India. A sabre executed and exhibited by Hadj-Braham-Ben-Salen, in the Algerian collection, is also remarkable for the fineness of its blade and the richness of its mounting, which is in silver repoussé with inlay of gold. Turkey also sends some of the far-famed damask blades, with rich mounting of oriental pattern. The daggers and swords exhibited by M. Zuloaga, son of the celebrated gunmaker of Madrid, certainly bear the palm among European ornamental arms for purity and taste in the design, and excellence and precision in the execution of the arabesques with which they are almost covered; the style of ornamentation is the same as that adopted by his father, and already mentioned in speaking of the fire-arms, viz., gold inlay on iron, the gold forming in some cases the ground, and in others the object of the pattern, and also chiselled work in iron of remarkable execution. Many of the French manufacturers also exhibit ornamental arms of great richness and taste, such as the swords of state by M. Delacour, who is said to have rediscovered a lost process for the manufacture of a kind of shagreen, which he uses successfully in the fabrication of scabbards; he is also in possession of a means of giving a clear white colour to shark's skin, which he has turned to a good account. M. Lepage-Moutier exhibits a sword and dagger, with damask blades, said to be made by a peculiar process rendered public by the Duc de Luynes, to whom they belong, a sabre, with a hilt of lapislazuli, and a shield in repoussé work, by Wechté, representing the Massacre of the Innocents. M. Duchesne shows a number of swords mounted in brass and iron by the aid of self-acting filing machinery, by which the pieces are made precisely similar, for facility of removal or exchange of parts,—the hilts are made rough by being covered with a kind of engine-turning like filigree work; a scabbard for an infantry officer, with moveable mountings, and one for cavalry, in which the mouth opens with a spring to facilitate the sheathing of the sword when on horseback, appear to be extremely ingenious, but have not as yet been tested by actual use. Some handsome blades, exhibited by M. Duval, are said to be made of a compound metal, composed of cast-steel, platinum, and nickel. The sword-making trade of the town of Solingen, in Prussia, to which the grande médaille d'honneur has been awarded, exhibits the finest collection of sword-cutlery in the Exposition, which is remarkable for the variety of their forms, the beauty of their polish, the richness of the gilding on the blades, and the

Prussian blades.

moderate price at which they are offered; a cimetar with damask blade, and a guard in cast-steel, by M. Lümschloss, and some rich damask blades by M. Holler, deserve especial notice. England was wholly unrepresented in this branch of manufacture, with the exception of two exhibitions of swords and bayonets from Birmingham and of those already mentioned from her Indian possessions; and in the collections of goods and manufactures from other countries there was a total absence of anything that could be said to form a representation of the national manufacture of trenchant arms.

Military Engineering, Equipment, &c.

Military engineering, &c.

Having thus passed in review the objects exhibited connected with Class XIII. as far as actual weapons are concerned, we have next to do with all that very varied and numerous class of articles which are included in such vague and comprehensive terms as military engineering and equipment, under which latter head may be comprised not merely the actual objects in use in warfare, but also the application of machinery to their manufacture, and all the ingenious contrivances directly or indirectly connected with the military profession, to which the present fact of an important war happening in an age marked for intelligence and mechanical genius and invention have given birth, and which show themselves in so many different schemes for the comfort or annoyance of our own armies or those of the enemy, and their respective preservation or destruction.

Fortification.

In military engineering, a drawing containing a plan and section of a system of fortification proposed by Col. Brock, of the Swedish service, is the only example of this science in the Exhibition, and appears a good application of that known as the Prussian system; it is extensively casemated, and is apparently an extremely expensive construction. Some specimens of walls of wood faced with iron, proposed by a French civil engineer, M. Aubert, said to be shot-proof, and so constructed that they cannot be struck without the shot being met by one of numerous small ridges with which the surface is covered, and a drawbridge in the English department, are the only things that can be said to come under the head of the art of defence. A M. Lorentz exhibits a scaling ladder, in which the rungs (of wood and iron) can be removed from the poles for facility of packing, and so contrived that a length of the ladder can be set up in the form of a capital A, with one pole for each leg, and

Lorentz's scaling ladder.

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one rung for a cross piece ; and the inventor proposes to form tents with two of these ladders, by setting up one of these A's at each end, connecting their vertices with a ridge rope, which should be carried to some little distance and well picketed into the ground, and throwing a tentcloth over the frame so formed ; a small tent exhibited by him on this principle seems to give much greater steadiness than those in which single poles are made the supporters. The same person is the inventor and exhibitor of a camp bed of wood, which packs into a bag 18 inches long by 6 inches diameter, and weighs 14 pounds.

White's portable barrack.

In the English part of the Exhibition is a portable barrack or hut, invented by Mr. Timothy White of Portsmouth, which seems to offer some advantages. The hut exhibited is calculated for 50 men, its dimensions are 62 feet long, by 16 feet wide, 6 feet high to the eaves, and 9 feet high to the ridge ; it is formed of light wooden framework, covered with sheet zinc or galvanized iron, and the necessity of diagonal bracing is obviated by a slope or lean inwards being given to the walls. For convenience of packing, and to facilitate its erection, the hut is formed of a number of sections, of 2 feet 3 inches each, set side by side in the direction of its length, and each section consists of four pieces of equal size, viz— 9 feet by 2 feet 3 inches, two of which form the walls, and the remaining two the slopes of the roof, each section being the width allowed for a man, the hut can be increased at pleasure for any number. The inventor proposes slinging hammocks for the men in these barracks, for which he claims that they are wind and water proof, and so simple as to be easily erected or stowed away by the soldiers themselves, fifty men being able to erect a barrack large enough for themselves in an hour, and to pack it in the same time. The weight of the hut in question is stated to be under two tons, and, if this is the case, it is lighter than those sent to the Crimea in the proportion of 2 to $5\frac{1}{2}$, or little more than one-third of their weight.

Aubert's portable barrack.

A model of a portable barrack is also exhibited, by M. Aubert, the inventor of the shot-proof walls before mentioned, which is composed of a framework of tube and angle iron, but so heavy and clumsy as to create great doubts of its being of any practical use. English tents are represented by

Tents and beds.

Edgington, who has a three pole tent similar to that which gained a prize in 1851, and Esnouf and Manger, who exhibit an ingeniously constructed bell tent with perpendicular walls, strengthened with wooden framework which also forms a box into which the tent can be packed ; the pole

also shuts up like a telescope to save room in packing, but from its size and weight when packed, being much greater than those of ordinary tents, without affording any great counterbalancing advantages, it seems much better adapted for an emigrant's or sportsman's tent than for military purposes. There is also among the English tents a small wooden camp bed, which has a ridge cord attached to light poles at either end of it, over which a waterproof cloth can be thrown to form a kind of small shelter in an emergency; and a camp mattress is exhibited by Mr. Medwin, made of ground cork, and lined on one side with oiled calico, so that it can be used on the ground without a bedstead, the non-conducting nature of the cork preventing the cold being felt through it; it is not more than an inch and a half in thickness, and is of trifling weight and bulk.

Knapsack.

An improved knapsack is exhibited by a Mr. Campion, late of the 52d Foot, in which steel hooks over the shoulder are substituted for straps as the support, and which he states to be less distressing to the soldier than the one at present in use, and more easily put on and taken off.

Soldiers' shoemaking.

A. M. Sellier, master shoemaker of the "Chasseurs à pied," exhibits a number of improvements in the equipment of a French soldier, viz—a knapsack, with a waterproof store for cartridges at the back; a cartouch box, in which there is a small groove capable of containing forty-two copper caps so as to be easily taken out by the soldier; a laced boot, to combine the shoe and gaiter in use in the French service; and, lastly, a system of screwing the uppers and soles of soldiers' boots together instead of sewing them, for which he claims that it is much more durable than the method commonly used, and makes at the same time a more waterproof joint. He has invented a very neat little machine, which taps a screw on a bit of brass wire, screws it into the boot, and cuts it off, at the same time pressing the two pieces of leather very forcibly together; he states that six regimental shoemakers can, in this way, make from twelve to fifteen pair of shoes in a day, whereas it takes at present double the number for the same quantity of work. Among the French collection of military equipments is found a most complete coffee apparatus for an officer in the field; it is the invention of a French officer, and is very simple and compact. It consists of the following articles:—1. A small boiler, in which is made the coffee, which is poured out ready filtered by the pressure of steam. 2. A small tin chimney or screen to afford shelter to the flame of the lamp. 3. A spirit lamp. 4. A double filter for the coffee. 5. Sugar

Portable coffeepot.

basin. 6. A metal cup, with a moveable handle. 7. Its handle. 8. A spoon. 9. A bottle of brandy. 10. A flask of spirits of wine for lamp. 11. Box for coffee. 12. Box for tea. 13. Box for lucifers. 14. A portable filter, for drinking from pools of water. 15. A sort of frame for holding the coffee-pot, and, 16. A cylindrical case to contain the above-named articles. All the pieces are so disposed as to shut into each other, and the whole when packed together forms a cylinder of 9 inches in height, and $3\frac{1}{2}$ inches in diameter, which, as the inventor justly observes, is but a small volume for an article so complete.

Loysel's coffee apparatus.

An apparatus for making coffee for troops on a large scale is exhibited in the English section by Mr. Loysel, which has been used at two of the refreshment stalls during the whole exhibition with great success. His principle is to force the water through the coffee by the hydrostatic pressure of a column of water, varying in height with the size of the apparatus; and one of those exhibited, standing in a space of about four feet by two feet, and with a height of perhaps ten feet, has several times made between 2,000 and 3,000 cups of very strong coffee in the day of seven hours, and I have no doubt a much greater quantity could have been supplied had the demand been greater.

Machine for producing heat by friction.

An apparatus which has attracted considerable attention is that exhibited by MM. Beaumont and Meyer, for the production of heat by friction, and performing the office of cooking entirely without fuel. In this machine, in which, of course, the sole novelty is in the application, a wooden truncated cone covered with plaited hemp is made to revolve quickly in the interior of a similarly shaped cone of polished brass, the two being kept in close contact by a slight pressure on the larger end of the wooden cone, and the hemp being kept profusely lubricated with oil. The brass cone forms, as it were, a flue or tube inside a cylindrical boiler filled with water, and it has been found by actual experiment that with ten square feet of rubbing surface, and with a speed of 600 revolutions a minute, 66 lbs. of water can be evaporated in an hour, and that the water and steam when confined can be raised to such a temperature as not merely to boil and stew, but to roast meat and perform every operation of cooking. The inventors exhibited a smaller machine of this kind before H.M. the Emperor, in which four soldiers cooked the rations of between twenty and thirty in less than an hour; and they are now constructing a still smaller machine, by which one man will be able to cook the rations of five or six without any kind of fuel, the whole apparatus weighing

only 1 cwt., and packing into a few cubic feet. The advantages of this apparatus can be understood in cases such as at the camp before Sebastopol in the winter of 1854–5, when fuel was impossible to be obtained except in small quantities and at great expense of labour both of men and horses; and the inventors contend that if the same horse-power that was expended in bringing up fuel to the front had been employed in working their apparatus, many valuable animals might have been saved, and much misery avoided for all ranks of the army. Proper drawings of this machine were procured by me in Paris, and are now in the possession of the War Department, London.

Army bakery.

While on the subject of cookery, it may be as well to mention an army bakery exhibited by a M. Delille, in which the entire apparatus, kneading-troughs, ovens, &c. &c. are contained in a four-wheeled military covered cart; it appeared compact, light, and well calculated for its purpose; but as no account was given of the quantity of bread that it was capable of turning out per diem, its efficiency could not be properly judged of.

Huts of "toile caoutchouté."

A material termed by the exhibitor "toile caoutchouté," seems well adapted for the construction of huts and other buildings of a temporary nature; it is made of canvas, payed over with a kind of varnish, and with the addition, in some cases, of being sanded, this latter operation being said to render it incombustible; some of it is also prepared white and semi-transparent, to serve for windows. Several small houses made with wooden frames filled in with this material were exhibited, and one was used by one of the inspectors employed by the Imperial Commission as an office, and with a very small stove was always perfectly warm and dry during the Exposition and till a late period of the year, when the weather was often trying both with wet and cold, and wind. A hut of this kind, 13 feet in length by 10 feet in width, and about 8 feet to the eaves, weighs about 800 lbs., and can be supplied by M. Gagin for 16*l.*; another, 26 feet by 20, for 24*l.*; and another, 30 feet by 20 feet, 10 feet high to the eaves, with four rooms, doors, casement windows in semi-transparent material, lined throughout, with boarded floor, canvas ceiling, and ornamentally treated outside, is offered for 100*l.*

Pontoons.

The only pontoon in the Exhibition is one by a M. Radowicz, and is made of a framework of wood covered with waterproof canvas, the sides and ends falling down on the bottom when packed for travelling, but offering no advantages or improvement worthy of imitation. Among

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the various articles of equipment may be mentioned a "hache échelle," as it is termed, exhibited in the French collection of swords, &c.; it consists of a boarding-axe or pike, with a long handle, probably eight feet long, from which a number of little steps can be made to project; a hook is provided at the end, by which it can be hooked on to any chance projection, and then made use of as a ladder; it does not seem to offer any practical advantage, as to a seaman the steps would be rather in the way than otherwise; and no one who has ever been long at sea would require such assistance, but would easily climb by the aid of the handle alone.

Military carriages.

A series of military carriages in use in the French service is exhibited by the carriage department of Vernon, their principal arsenal for this kind of work; these are an ambulance, differing but little from that now in use in the English service, except that it appears somewhat heavier; nearly the same remark may be made respecting the waggon for forage, that for carrying rations, and the park or tool waggon, none of them presenting much difference from our own, with the exception of the draught by pole instead of by shafts, as with us. A forge waggon differs from the English one in having the forge turned the other way on the waggon, or facing inwards towards the limber, so that to get at it properly for work the waggon must be unlimbered, whereas with the forge turned to the rear it can be used on the line of march. A good drag-chain is attached to these waggons, which offers a suggestion for improvement; instead of its being necessary to stop the waggon to take off the skid, a loop or bight in the chain is let go by striking a slip-shackle, and the chain is thus lengthened sufficiently to allow the skid to drop behind clear of the wheel, from whence it can be restored at leisure to its original position. The same department exhibits two mules, with litters attached to the pack-saddles for the conveyance of wounded; one mule with boxes of instruments and medicines for field hospital; and also two cases of surgeons' instruments, that seem to be admirably packed and contrived; one of them is fitted in a knapsack for infantry service, and the other in a cavalry valise.

Fire engine.

In the section of military apparatus for the extinction of fires, a fire-engine constructed at Montreal, by Messrs. Perry, Brothers, and exhibited by the Colonial Government of Canada, must not be omitted, as it seems peculiarly adapted for military purposes. It is so constructed as to be drawn by men, is remarkably simple in all its parts, little liable to

get out of order, easily cleaned and repaired should such be the case; and with extreme lightness and greatly diminished bulk is capable of equalling, if not surpassing, in power most of the larger and heavier engines now in use. At a fire that occurred in Paris during the time of the Exhibition, in which the military bakery and government flour stores were unfortunately destroyed, such good service was rendered by this engine as to have attracted the attention and drawn forth the commendation of the General commanding; and such was the quantity of water thrown by its hose, that the labour of 200 men was at once dispensed with, and with 20 men at its pump, two of the French military fire-engines were kept at full work by the water supplied by it alone.

Machine for cutting out army clothing.

Among the objects to be enumerated under the head of equipment may be mentioned a machine exhibited by an American for cutting out army clothing, and by which he states one man can cut out 1,200 pairs of trowsers in a single day; the machine consists of a single straight knife-blade set perpendicularly or on its point, and being moved in that direction by steam-power; by a simple contrivance its direction can be changed, so as to avoid turning about the cloth on the board, and the clothes are cut out in thicknesses of from thirty to forty at a time, and with great rapidity.

Pyrotechnics.

This completes the section of military equipment, and the only other remaining is that of pyrotechnics, which, on account of the prohibition contained in the Regulations of the Imperial Commission, is but thinly represented. Some gunpowder, saltpetre, and some charcoal obtained by steam process are sent from Belgium; from Sardinia comes a celebrated powder called "grain Mathias." Doré, of Paris, exhibits a percussion fuze for miners. A code of military signals by rockets of a complicated nature appears in the French exhibition; and Sweden sends refined nitre in a large mass by Rouquint; and these, with some collections of copper caps from Birmingham and Paris, complete almost the entire list of pyrotechnics in the Exhibition.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Results of a series of Experiments on the Strength and resistance of various Woods.

Introductory report.

THE various collections of specimens of their woods, contributed by different countries to the Paris Exhibition, naturally come under the general head of Forestry, and, as such, belong to the Second Class of the system of classification adopted by the Imperial Commission, and have doubtless, been dealt with generally by the jury of that class; but when considered in reference to their particular qualification for special purposes, some of these descriptions of timber also enter into the classes which treat of those branches of Art or manufacture, and it is in this way, that in their character of woods of construction, they are found enumerated in the first section of Classes XIII. and XIV., in which classes they are not, however, considered in reference either to their culture, botany, or general properties, but particularly as regards those qualities by which they are rendered suitable for the purposes of the arts treated of in those classes, viz., naval and military art and civil construction; and their value in this respect being mainly affected by such material qualities as their strength, toughness, weight, and elasticity, the present seems not an improper place for introducing the results of a series of experiments on these points made during the Exhibition upon some of the specimens of woods then for the first time brought in competition with each other, and with the ordinary woods already employed by the shipbuilder and carpenter.

Reasons for introducing woods into Class XIII.

Countries exhibiting woods of construction.

Of woods adapted for shipbuilding and construction generally, the principal collections in the Exhibition were contributed by India, Canada, Australia, British Guiana, Jamaica, Van Diemen's Land, &c. Specimens of woods for various purposes were exhibited by many foreign states; viz., France, Algeria, Austria, the Dutch Colonies, &c., but those from the British Colonies above mentioned come more directly under the head of Classes XIII. and XIV. as woods of construction, and in the contributions sent to the Exhibition by these countries, the prominent place is given in each case to their valuable collection of specimens of native woods. Of these, many, as in the case of the Canadian and some of the Indian timbers, are well known and commonly used in this country, but on examining the Colonial cata-

logues long lists are found filled with the names and descriptions of various kinds of woods used and valued in the colonies to which they belong, but in most cases unknown in England, and of the merits of which, as compared with the known timbers of commerce, the colonists themselves are totally ignorant.

The present appearing a favourable opportunity for instituting a comparison between some of those woods and those better known in Europe, it was resolved to submit such of the specimens as could be obtained to a series of experiments, with a view to testing as fully, as possible, their qualities of strength, weight, toughness, elasticity, &c. Unfortunately, the specimens sent were generally of such small dimensions as to be totally useless for any practical test of strength, and many of them were exhibited as specimens of some individual peculiarity of growth or accident, rather than as average representations of the class of timber to which they belong. In the case of three colonies; viz., Australia, British Guiana, and Jamaica, there seem however, to be sufficient data for obtaining some knowledge as to the comparative value, &c. of a number of different descriptions of timber, some being largely used in the localities in which they are produced, and considered by the colonists to be superior, in many cases, to the woods commonly employed for similar purposes in England.

Testing machine.

A very accurate and delicate hydraulic machine for testing the strength of materials having been placed at my disposal by Mr. Dunn, of Manchester, I commenced a series of experiments on such specimens as could be obtained from the Colonial Commissioners, which were carried on in the part of the Exhibition building devoted to machinery, during the months of July, August, and September, and of which the history and results are here given.

The testing machine consisted of a hydraulic press with the piston-rod furnished with a cross-head, working horizontally in cast iron guides, and having a connecting rod attached to it reaching to the end of the guides; a small valve in the cylinder, furnished with a steelyard and moveable weight gave the means of ascertaining to a great nicety the exact amount of pressure applied.

Description of experiments.

As it was desirable, for obtaining the best comparative results, that the woods should all be tested as nearly as possible, under similar circumstances a standard dimension was sought which should be the greatest common to all the specimens, and it was found that a scantling of two inches square with a length of from 14 to 16 inches was the

Standard dimensions of specimens.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

greatest that could be obtained to fulfil this condition; a few examples would not quite come up to this scantling, and one or two would not quite give the required length, but on the whole it was thought better to reduce the results obtained from these by calculation, than to cut down the size of all the pieces operated on for the sake of the few. The Australian specimens were generally from 4 feet 6 inches to 5 feet in length and about 2 inches square, and these were first experimented on at these dimensions, and afterwards reduced to the fixed standard.

The mode of proceeding was as follows—the specimens were first reduced to the standard dimension, squared and planed perfectly true, labelled with a number, and entered in a catalogue.

Specific gravity.

Each piece was then carefully weighed and its specific gravity calculated.

The first experiment made was to ascertain the breaking weight, the specimen being supported at the ends and the strain being applied at right angles to its length, midway between the points of support.

Experiment for transverse breaking weight.

The bearing chosen as the standard was 1 foot, that being the greatest that was common to all the specimens, and two flat iron bars were accordingly fixed to the extremities of the guides of the machine at that distance apart, to serve as the points of support, a piece of iron, having an opening in it of 3 inches square, was shackled on to the end of the connecting rod of the machine through which the piece of wood was passed; the two ends were then brought to bear equally on the points of support, and the square ring above mentioned adjusted to the centre; a piece of strong leather was interposed between the ring and the wood to prevent any abrasion of the fibre which was likely otherwise to take place under heavy strains; the weight of the connecting rod and ring was then carefully counterpoised so as to avoid any disturbance of the strain from its true horizontal direction, and a slip of paper was fastened by beeswax to the upper part of the specimen at its centre, on which to note the deflection.

Deflection.

The weight on the steelyard having been placed at zero, the pump was slowly worked until the steelyard showed the first symptoms of motion; a straight edge was then applied to the two fulcra or points of support, and a line ruled across a slip of paper attached to the specimen and marked 0 Experience showed that in general no very perceptible deflection took place until the strain had reached 500 kilogrammes (1,102 lbs. English) and to follow out the principle

of treating all the woods alike, the plan adopted therefore was to mark the deflection at each successive 500 kilogrammes of strain until it reached 3,000 (6,612 lbs.). As it was found that the increase of deflection became more rapid as the point of fracture was approached, the deflection was noted at intervals of 250 kilogrammes (551 lbs.) instead of 500 kilogrammes, when the strain exceeded 3,000 kilogrammes.

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The exact point of fracture was easily discernable, as the steelyard of the machine, which had been gradually rising under the pressure instantly fell, and could not be raised by any subsequent action of the pumps.

This experiment was repeated with as many examples of each kind of wood as could be obtained and the mean noted, throwing out such experiments as were evidently unsatisfactory from being performed on a faulty specimen, or from any other cause.

In order to ascertain the power of the woods to bear a crushing strain, a number of small pieces, each measuring exactly an inch cube, were cut from the specimens and squared and planed true, a square bar of steel was introduced into the ring of the machine, having its ends bearing on the supports above mentioned, and the cubic inch specimens were each submitted to a crushing strain between the ring and the steel bar; this strain was applied both in the direction of the grain and also in a transverse direction, forming two distinct series of experiments.

Experimen for crushing strain.

In applying the strain in a longitudinal direction, the specimen having been placed in position, a slip of paper was fastened to the top of the ring, and the steelyard having been brought to zero, and noted as before, the amount which each specimen yielded to the crushing strain was marked on the paper at each 500 kilogrammes (1102 lbs.) in the same manner as has been already explained in the case of the deflection, until it finally gave way, the point of failure being well marked, as in the former experiment.

When the specimens were submitted to a tranverse crushing strain, the failure, instead of being marked and sudden, as in the former cases, took place by degrees, the fibre gradually yielding from the first moment of the strain being applied, but no actual fracture taking place, the method of proceeding was therefore changed, and all the specimens having been submitted to the same strain, the amount of compression which each experienced was carefully marked and measured as before.

Transverse crushing strain.

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As before-mentioned, the specimens of wood from Australia were experimented upon separately, as in the first experiment, but with a bearing of four feet instead of one.

Description of tables.

In recording the results of these experiments a separate table is first devoted to each description of wood, in which is given a detailed account of the various tests to which it has been submitted, remarking on any peculiarity either in the specimen or in its mode of fracture or conduct under pressure, and adding such particulars as could be had concerning each. The order followed is the same throughout, viz., first, the name of the colony in which the wood is produced, then the various denominations under which it is known, whether botanical, aboriginal, or colonial; a short description follows, containing such information as could be obtained concerning the description of tree producing the timber, its abundance or scarcity in the colony, its proximity to the coast or to navigable rivers, the purposes to which the timber is applied in the colony, and the estimation in which it is held there for strength, durability under various circumstances, or any other valuable quality that it may possess; where its cost in the colony, per foot cube, could be ascertained, it is given, and the diameter and height of the tree is added, as affording an index of the size of timber possible to be obtained. Then follows the history of the experiments in the order described above.

At the end, a resumé of the whole is given in a series of four tables, in which the woods are placed in the order of their value in that particular experiment to which the table refers.

Tables of final results.

Table No. 1. Specific gravity.
„ No. 2. Transverse breaking weight.
„ No. 3. Crushing strain in the direction of the fibre.
„ No. 4. Transverse crushing strain.

In Table No. 2, the value of s is also given for each wood.

As for most purposes a timber acquires additional value from combining the properties of strength and lightness, a fifth table is added in which the woods experimented upon are arranged in the order in which they stand as to the ratio of their strength to their specific gravity.

The steelyard of the testing machine having been graduated for French weights, the results of the experiments were noted in kilogrammes, and afterwards reduced into English pounds avoirdupois and decimal parts, and the

deflections were marked in inches and decimals of an inch. This will account for the apparently irregular intervals at which the amounts of deflection and yielding were noticed. CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Note.—In conducting and registering these experiments, I was assisted by Corporal James Mack of the Royal Sappers and Miners, who displayed the greatest zeal, intelligence, and ability throughout.

In the catalogue of Australian products contributed to the Paris Exhibition, the following appears as an introduction to the list of woods indigenous to New South Wales. It is from the pen of W. McArthur, Esq., Chief Commissioner from that colony to the Exhibition, and the collector and exhibitor of the specimens of wood from which those experimented upon were taken; and as the information which it affords gives additional value to any experiments on the woods of that colony, it is here given intact. Mr. McArthur's note on Australian woods.

CATALOGUE (see No. 77) of SPECIMENS of WOODS indigenous to the SOUTHERN DISTRICTS, collected by Mr. W. McARTHUR, and exhibited by the Commissioners; with remarks descriptive of the nature of the Trees, and the qualities of their Wood, so far as these could be ascertained.

A short description of the general features of the kinds of woodland from which have been collected the majority of the specimens of woods hereinafter described in detail, with a few observations upon the general character of the latter, would seem to be a desirable introduction to the catalogue. They will be useful in rendering the subject more intelligible to all who have not had the opportunity of informing themselves by personal observation. For greater convenience, the different descriptions of natural woodlands will be included under three classes; and the letter denoting its class will be inserted opposite to each specimen of wood. Description.

Class A.—Forest more or less open; generally composed of trees with little or no underwood; their trunks more or less naked and lofty, height being a more conspicuous feature than diameter; their heads small in proportion to the trunks, divided into few secondary or tertiary ramifications, and thinly clothed with persistent, dry, dull-coloured, thick, leathery leaves, abounding in essential oils, and in their decomposition adding little to the vegetable matter in the soil. The different species of Eucalyptus and Angophora, with Melaleuca, Callistemon, Syncarpia, and Lophostemon, compose the larger trees which furnish all the common durable hard wood timber used in Sydney and the adjoining districts. Occasionally these dry forests pass into tracts crowded with trees, generally of a single species (still with little or no underwood), their trunks being drawn up to a great height, and of small diameter. The trees of this class are usually produced to a greater size, and with better quality of timber, on lands rather poor than good; the more fertile lands commonly producing trees of comparatively small dimensions, thinly scattered over their surface. The rich alluvial lands on the margins of rivers are exceptions to this rule. They are almost always heavily timbered, and towards the coast their character passes from A. to C. Class A.

There are some characteristics applicable to the whole of the large trees of this class. When at full maturity they are rarely sound at heart, and Characteristics.

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Characteristics.

even when they are so, the immediate heart-wood is of no value on account of its extreme brittleness. In sawing up logs into scantlings or boards, the heart is always rejected. The direction in which the larger species split most freely is never from the bark to the heart (technically speaking, the "bursting way"), but in eccentric circles round the latter. Some few of the smaller species of forest trees are exceptions to this rule; such as the different species of Casuarina, Banksia, and other species belonging to the natural order Proteaceæ. The latter, however, with little exception belonging to Class B. They split most freely the "bursting way," as do the Oaks, &c., of Europe and America. A very serious defect prevails amongst a portion of the trees of this class, to such extent, as to demand especial notice here. It is termed "Gum vein," and consists simply in the extravasation, in greater or less quantity, of the gum resin of the tree in particular spots, amongst the fibres of woody tissue, and probably where some injury has been sustained; or, which is a much greater evil, in concentric circles between successive layers of the wood. The former is often merely a blemish, affecting the appearance rather than the utility of the timber; but the latter, when occurring frequently in the same section of the trunk, renders it comparatively worthless, excepting for fuel. In the latter case, as the wood dries, the layers with gum veins interposing separate from each other; and it is consequently impracticable to take from trees so affected a sound piece of timber, excepting of very small dimensions. The whole of the species of Angophora, or apple-tree, and many of the Eucalypti, or Gums, are subject to be thus affected; and it is the more to be regretted, because it appears to be the only reason why many of the trees so blemished should not be classed amongst the most useful of the hard woods of the colony. Another characteristic among these hard woods is deserving of notice. Although the majority of them make excellent fuel, and are valuable on account of the comparative quantity of steam they are capable of generating, the greater part are slow to kindle, and a few of them will hardly burn at all. To this circumstance, probably, is to be attributed the small number of houses burnt in a climate and amongst a population likely to afford an unusual proportion of such accidents. Few of the species of Eucalypti are rich in potash, but several of the genus Angophora contain it abundantly.

It would be difficult to form even an approximate estimate of the number of species of Class A. producing good timber, throughout the settled districts of New South Wales. It is believed that very few of them have a wide range; the same local names being applied many times over to different species in different districts.

Class B.

Class B.—Barren scrub, covered either wholly with low shrubby vegetation without trees, or with short-stemmed stunted trees, rarely or never producing serviceable timber. The same dry character of vegetation prevails over this description of country as over the last. The "bush-fires" which sweep over these barren scrubs once, at least, in every four or five years, effectually prevent the species which do not grow with naked trunks from obtaining the dimensions they might otherwise be susceptible of acquiring. At each burning the majority are killed to the ground to be re-produced from the collar. Good specimens of their wood for illustration are, therefore, scarcely attainable. It may be observed, that the majority of the beautiful flowering shrubs of the colony have their habitats in this sort of country, which is always more or less rocky, stony, or sandy.

Class C.

Class C.—Rich Brush or "Cedar Brush." Tracts of country rarely of great continuous breadth, but often alternating at short intervals with Class A., and prevalent only at moderate distances from the sea, or at, all events, to the eastward of the great dividing range.

Description of the woodland.

This description of woodland often occupies country covered with rocks and stones, but of such geological character that a rich soil results from their decomposition. It usually follows the course of streams; and, in country favourable, geologically speaking, to the formation of good land, the cedar brushes fill up the vallies and the gorges of ravines with their dense vegetation. They are to be found in the greatest perfection at Illawarra, a few miles from the open seacoast, upon natural terraces skirting the mountain side at various elevations, up to 1,500 feet, and upon rich alluvial plains, particularly in the districts to the northward of Sydney, where they are described to be of great continuous extent. They produce few shrubs, but a variety of trees of considerable altitude, frequently of comparatively slender growth, almost universally clothed with beautiful, dense, bright green foliage, their umbrageous character being much increased by the numerous lofty ligneous climbers ("bush ropes") which attain their topmost branches, and frequently throw themselves from tree to tree. At Illawarra and in some other districts four species of arborescent ferns and two noble species of palms add materially to the tropical aspect of this description of country. A few of the trees of Class A. are to be observed thinly scattered through the cedar brushes. In such case they often attain the most magnificent dimensions, but their general character remains unaltered.

During the heats of summer, the atmosphere of the cedar brushes is always much less dry, and the temperature more equable than it is upon adjoining lands not clothed with rich vegetation. Bush fires rarely or never extend into their recesses, which are difficult to penetrate, even on foot, owing to the numerous irregularities of surface which prevail, and to the tangled nature of the vegetation. These difficulties apart, nothing can be imagined more charming to the beholder; especially where glades or natural openings occur, to enable him to comprehend the full grandeur of the still life around him. The extreme loftiness of the noble trees, which are thrown together in surprising variety, with stems, rarely cylindrical, but of the most picturesquely irregular forms, covered with mosses and orchids, and loaded aloft with huge masses of epiphytical ferns of exquisite beauty; all these vegetable wonders, viewed in the transparent, green, and almost sunless light, which even on the brightest days pervade their recesses, combined with the delicious fragrance and the agreeable temperature, which in fine weather invariably characterises the ceder brushes, astonish and gratify the lovers of sylvan scenery. But although the senses are charmed, the difficulties in exploring them, to ascertain of what species of trees they consist, are very great; and still more serious are the obstacles to be surmounted in getting out new trees when found. The common use of the wood of the cedar (Cedrela Australis) in joiners' and cabinet work, and its extensive importation to the neighbouring colonies and to Europe, have induced the sawyers to penetrate into every nook from whence sawn timber could be dragged out. But in seeking out this particular tree, they would appear to have neglected all the rest. The most experienced amongst them have no names for a great number, and can give little information to be relied upon with regard to the qualities of their timber. They have been in the habit of confounding together numerous species under the general head of "brush trees." It requires careful and laborious investigation on the part of a stranger in these brushes, to distinguish trees of even very different families; their foliage is often so far overhead, and so intermingled with that of the neighbouring trees and climbers, their trunks are so covered with epiphytes, and the light is so imperfect, that the tree often requires to be cut down to determine its identity; even then it frequently becomes further requisite to cut down several of the neighbouring trees, which have their branches attached to it by the "bush-ropes," before the tree will fall,

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Description of the woodland.

and bring the foliage within the explorer's reach. The uncertainty of their periods of flowering and fruiting gives rise to further difficulty. On the present occasion, although they have been repeatedly examined at short intervals over a period of six months, comprising the seasons at which they might be expected to show flowers or fruit, it is remarkable how few have been detected in a fertile state. These few forming the exception rather than the rule with the particular species to which they belong, it would appear to be certain that the great majority of the trees of this class do not flower every year, and many of them only at long intervals. In proof of the intimate intermixture of many kinds of trees, it may be stated that, skirting a narrow track through a cedar brush for about half a mile, more than sixty species were observed, all growing within twenty or twenty-five yards of the track; of these, above three-fourths were of the stature of trees. It may be remarked, also, that no two brushes resemble each other precisely; fresh species of trees make their appearance in each succeeding brush, whilst others disappear. This characteristic seems to prevail wherever an opportunity of examining them closely has been afforded. The timber of the trees of this class differs remarkably from Class A. The grain is much finer; it is also, for the most part, sound at heart; and the heart-wood, if not shaken in the fall of the tree, may be used, as is the case, with the timber trees of Europe; even when a very large size, and not sound at the butt, they are usually perfectly so a little higher up; they differ generally, also from the trees of Class A., in splitting most freely the "bursting way." Although their qualities be so little known, it is not to be doubted that some of them would prove of great value. The very imperfect collection of them, which has been made on this occasion, affords evidence that some possess considerable beauty. At the same time, it should be observed, that the timber of a considerable portion is not durable when exposed to the weather or to damp; and that, as a class, they are, neither for strength nor lasting qualities, to be compared with the numerous, more coarsely grained, but almost imperishable woods of Class A.

Mr. Holmes on the Woods of British Guiana.

Mr. Holmes, the Commissioner for British Guiana, in supplying the prices and descriptions of the various specimens of wood from that colony, has also sent the following information, which is most important in a commercial point of view :—

The colony is intersected by numerous large rivers, navigable for vessels of large burden, which can thus penetrate into the heart of primitive forests capable of affording an unlimited supply of timber, and as in many parts of the colony the trees are cut down in the immediate vicinity of these rivers and creeks, the cost of the wood, which has been given wherever it could be ascertained, depends alone on the price of labour for felling and squaring.

NEW SOUTH WALES.

New South Wales. No. 1. Water Gum.

No. 1.—Botanical name, Tristiania nerifolia. Natural order, Myrtaceæ. Aboriginal name, Ooramilly. Local name, Water Gum.

"A very fine tree, with lofty cylindrical boll; timber close-grained and elastic, valuable for boat building. Common at Illawarra, high up the side of the mountain; requires to be seasoned carefully."

The average diameter of the tree is from 30 inches to 50 inches. The average height from 100 feet to 130 feet.

Specific gravity of specimen, 1·001, water being 1·000. Specific gravity.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{3}{4}$		3967·2
2	1 1	$1\frac{3}{4}$		4848·8

Breaking weight.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102	0·12	0·05
2204	0·24	0·11
3306	0·59	0·19
4408	- - -	0·27

Deflection.

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THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
11020 lbs.	0·04 inch.
Crushing Weight	11020 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204	0·12
4408	0·18
6612	0·27
8816	0·61

Crushing weight (transverse).

New South Wales.

No. 2. Mountain Ash.

No. 2.—Botanical name, EUCALYPTUS PILLULARIS. Natural order, MYRTACEÆ. Aboriginal name, ——. Local name, MOUNTAIN ASH, or WHITE or WILLOW TOP.

"A remarkable specimen of Eucalyptus, found only on the summits of rocky or stony ranges; common over a wide extent of the great dividing range; with very dark-coloured rugged outer bark on the trunk, and smooth white bark on the branches; timber very hard, tough, and durable; much prized for poles and shafts of drays. Specimen collected very indifferent."

The average diameter of the tree is from 36 inches to 60 inches. The average height, from 100 feet to 130 feet.

Specific gravity of specimen, 1·110.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{7}{8}$	1	—
2	1 2	$1\frac{7}{8}$	1	7824·2
3	1 2	$1\frac{7}{8}$	1	8265·0
	1 2	$1\frac{7}{8}$	1	8044·6
6	1 2	$1\frac{7}{8}$	1	7934·4

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.
Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102	- - -	0·05
2204	1·69	0·09
3306	- - -	0·13
4408	- - -	0·17
5510	- - -	0·22
6612	- - -	0·26
7714	- - -	0·3

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
11020 lbs. - - -	- 0·07 inch.
Crushing Weight - -	- 11020 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
8816 - - -	- 0·12

Crushing weight (transverse).

New South Wales.

No. 3. Black Butt.

No. 3.—Botanical name, EUCALYPTUS MEDIA. Natural order, MYRTACEÆ. Aboriginal name, YARR-WARRA. Local name, BLACK BUTT.

"One of the largest of the Eucalypti, producing excellent, durable timber for house carpentry, or any purpose where strength and durability are the chief requisites; attains upwards of 30 feet in circumference, but in such cases is always very hollow."

The average diameter of the tree is from 36 inches to 72 inches. The average height is from 100 feet to 200 feet.

Specific gravity of specimens, 0·891.

Specific gravity.

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NOTE.— *The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
Breaking weight. 1	5 0	$1\frac{7}{8}$	4	3857·0
2	1 3	$1\frac{7}{8}$	1	8154·8
3	1 3	$1\frac{7}{8}$	1	7754·7
4	1 3	$1\frac{7}{8}$	1	5510·0
5	1 3	$1\frac{7}{8}$	1	6281·4
6	1 3	$1\frac{7}{8}$	1	6612·0
7	1 3	$1\frac{7}{8}$	1	8154·8
8	1 3	$1\frac{7}{8}$	1	7229·1

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
Deflection. 1102	—	—
2204	- - -	0·12
3306	0·56	No appreciable difference.
4408	- - -	0·14
5510	- - -	0·2
6612	- - -	0·25
7163	- - -	0·29
7714	- - -	0·44

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
4408 lbs. - - -	- 0·03 inch.
6612 „ - - -	- 0·04 „
8816 „ - - -	- 0·06 „
11020 „ - - -	- 0·18 „
Crushing weight (longitudinal). Crushing Weight - -	- 11020·0 lbs.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

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Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204	0·11
3304	0·44
4408	0·56
6612	0·60
8816	0·64

Crushing weight (transverse).

No. 4.—Botanical name, EUCALYPTUS Sp. Natural order, MYRTACEÆ. Aboriginal name, GNÀÖULI. Local name, WOOLLY BUTT.

NEW SOUTH WALES.

No. 4. Woolly Butt.

"Very large and fine timber tree; its wood much prized for felloes of wheels, and other work requiring strength and toughness."

The average diameter of the tree is from 36 inches to 72 inches. The average height, from 100 feet to 150 feet.

Specific gravity of specimen, 1·005.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{7}{8}$	4	3085·6
2	1 3	$1\frac{7}{8}$	1	7273·2
3	1 3	$1\frac{7}{8}$	1	4518·2
4	1 3	$1\frac{7}{8}$	1	4738·6
5	1 3	$1\frac{7}{8}$	1	3857·0

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102	-	0·03
2204	0·81	0·04
3306	-	0·08
4408	-	0·13
5510	-	0·19
6612	-	0·21
7714	-	0·34

Deflection.

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THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
1102 lbs.	Nothing perceptible.
2204 „	0·03 inch.
3306 „	No perceptible increase.
4408 „	0·04 inch.
5510 „	None perceptible.
6612 „	0·07 inch.
Crushing Weight	7063·8 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
1102	Not perceptible.
2204	0·07
3306	0·12
4408	0·21
5510	0·31
6612	0·34
7714	0·36
8816	0·4

Crushing weight (transverse).

New South Wales.

No. 5. Iron Bark.

No. 5.—Botanical name, EUCALYPTUS Sp. Natural order, MYRTACEÆ. Aboriginal name, BARRĒMMA. Local name, IRON BARK.

"The timber of this rugged-looking tree is of the highest reputation for strength and durability; differs from the Iron Barks of Cumberland and Camden."

The average diameter of the tree is from 36 inches to 72 inches. The average height is from 100 feet to 150 feet.

Specific gravity.

Specific gravity of specimen, 1·032.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In square.	Feet.	
1	4 6	$1\frac{7}{8}$	4	3416·2
2	1 3	$1\frac{7}{8}$	1	8485·4
3	1 3	$1\frac{7}{8}$	1	8816·0
4	1 3	$1\frac{7}{8}$	1	9190·7

Breaking weight.

REMARK.—*All the specimens evidenced great toughness, even after fracture, the parts separating with great difficulty.*

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102	Not perceptible.	0·03
2204	0·92	0·05
3306	1·51	0·08
4408	- - -	0·12
5510	- - -	0·16
6612	- - -	0·19
7163	- - -	0·23
7714	- - -	0·28

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
1102 lbs. - -	No perceptible yielding up to 8816 lbs.
8816 „ - - -	0·01 inch.
9918 „ - - -	0·11 inch.
Crushing Weight - -	9920·7 lbs.

Crushing weight (longitudinal).

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FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
1102	—
2204	0·05
3306	—
4408	0·52, at which point the specimen crushed to pieces.

Crushing weight (transverse).

New South Wales.

No. 6. Blue Gum of Camden.

No. 6.—Botanical name, EUCALYPTUS Sp. Natural order MYRTACEÆ. Aboriginal name, TDJETLAT BARROUL-GOURA. Local name, BLUE GUM OF CAMDEN.

"A very valuable timber, harder, tougher, more inlocked in grain, and more durable than the common Blue Gum; but not obtainable of nearly such large size; one of the most durable woods known; excellent for naves and felloes of wheels, and for work under ground."

The average diameter of the tree is from 36 inches to 48 inches. The average height from 80 feet to 100 feet.

Specific gravity.

Specific gravity of specimen, 0·843.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{3}{4}$	4	2655·8
2	1 2	$1\frac{3}{4}$	1	3306·0
3	1 3	$1\frac{3}{4}$	1	5621·0
4	1 3	$1\frac{3}{4}$	1	4518·2

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102	0·02	—
2204	0·04	0·10
3306	- - -	0·19

Deflection.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
2204 lbs.	0·04 inch.
4408 „	0·07 „
6612 „	0·09 „
8816 „	0·19 „
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
4408	0·08
6612	0·26
8816	0·64

Crushing weight (transverse).

NEW SOUTH WALES.

No. 7. Box of Illawarra.

No. 7.—Botanical name, EUCALYPTA Sp. Natural order, MYRTACEÆ. Aboriginal name, NGNOOROO-WARRA. Local name, BOX OF ILLAWARRA.

"Another Eucalyptus, with magnificent timber; the wood exceedingly hard, tough, and durable."

The average diameter of the tree is from 48 inches to 72 inches. The average height, from 120 feet to 180 feet.

Specific gravity of specimen, 1·170.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{3}{4}$	4	4518·2
2	1 1	$1\frac{7}{8}$	1	11240·4

Breaking weight.

Capt. Fowke's Experiments on Woods.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102	0·04	None perceptible.
2204	0·05	0·02
3306	0·14	0·05
4408	0·52	0·09
5510	- - -	1·1
6612	- - -	1·13
7163	- - -	0·16
7714	- - -	0·19

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
8816 lbs. - - -	0·05 inch.
Crushing Weight - -	9920·7 lbs.

Crushing weight (longitudinal).

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204 - - -	- 0·05
3306 - - -	- 0·06
4408 - - -	- Split all to pieces.

Crushing weight (transverse).

New South Wales.

No. 8. True Box of Camden.

No. 8.—Botanical name, Eucalyptus corymbosa. Natural order, Myrtaceæ. Aboriginal name, Bourrayrra-gourroo. Local name, True Box of Camden.

"A low, branching species of Eucalyptus, not very abundant; timber of excellent quality."

The average diameter of the tree is from 18 inches to 36 inches. The average height, from 30 feet to 50 feet.

Specific gravity.

Specific gravity of specimen, 0·970.

NOTE.—*The following Weights are reduced from Kilogrammes.*

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
	Ft. In.	In. Square.	Feet.		
1	5 0	$1\frac{7}{8}$	4	3086·4	Breaking weight.
2	1 3	$1\frac{7}{8}$	1	4628·4	
3	1 3	$1\frac{7}{8}$	1	4518·2	
4	1 3	$1\frac{7}{8}$	1	4518·2	
5	1 3	$1\frac{7}{8}$	1	4959·0	
6	1 3	$1\frac{7}{8}$	1	5333·6	

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.		
	Specimen 1.	Specimen 2.	
2204·6	- - -	0·04	Deflection.
3306·9	- - -	0·11	
4409·2	- - -	0·20	

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.	
8818 lbs. - - -	- 00·9 inch.	Crushing weight (longitudinal).
Crushing Weight - -	- 8818 lbs.	

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6 - - -	- 0·08	Crushing weight (transverse).
3306·9 - - -	- 0·47	
4409·2 - - -	- 0·50	
5611·5 - - -	- 0·53	
6613·8 - - -	- 0·55	
7164·9 - - -	- 0·58	
7716·1 - - -	- 0·59	

Capt. Fowke's Experiments on Woods.

New South Wales.

No. 9. Stringy Bark of Camden.

No. 9.—Botanical name, EUCALYPTUS Sp. Natural order, MYRTACEA. Aboriginal name, BOUR-ROUGNE. Local name, STRINGY BARK OF CAMDEN.

"A species yielding timber much prized for flooring boards and house carpentry, of considerable strength and durability; differs from the Stringy Bark of the coast."

The average diameter of the tree is from 24 inches to 54 inches. The average height, from 50 feet to 100 feet.

Specific gravity.

Specific gravity of specimen, 0·864.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	1	4	2755·7
2	1 4	1	1	3086·4
3	1 4	1	1	2888·0
4	1 4	1	1	3262·3

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102·3	0·04	—
2204·6	0·84	0·08

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
2204·6 lbs.	0·02 inch.
4409·2 „	0·04 „
6613·8 „	0·08 „
8818·4 „	0·12 „
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·26	Crushing weight (transverse).
4409·2	0·52	
6613·8	0·58	

NEW SOUTH WALES.

No. 10. Forest Swamp Oak.

No. 10.—Botanical name, CASUARINA Sp. Natural order, CASUARINACEÆ. Aboriginal name, COOM-BAU. Local name, FOREST SWAMP OAK.

"Small tree, usually forming small, detached, dense thickets in open forest ground, where the situation is moist; wood, tolerably close, prettily marked, not durable, but much used where lightness and toughness are required."

The average diameter of the tree is from 12 inches to 30 inches. The average height, from 40 feet to 80 feet.

Specific gravity of specimen, 0·661. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight in lbs.	
	Length.	Section.			
	Ft In.	In. square.	Feet.		
1	5 0	$1\frac{7}{8}$	4	2314·8	Breaking weight.
2	1 3	$1\frac{7}{8}$	1	4629·6	
3	1 3	$1\frac{5}{8}$	1	3416·2	
4	1 3	$1\frac{5}{8}$	1	3195·8	

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.		
	Specimen 1.	Specimen 2.	
2204·6	1·49	0·09	Deflection.
3306·9		0·18	
4409·2		0·30	

Capt. Fowke's Experiments on Woods.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

	Strain applied.	Amount yielded.
Crushing weight (longitudinal).	2204·6 lbs.	0·03 inch.
	4409·2 „	0·05 „
	Crushing Weight	5511·5 lbs.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·18
	4409·2	0·35
	6613·8	0·42
	8818·4	0·46

New South Wales.

No. 11. Bastard Box.

No. 11.—Botanical name, EUCALYPTUS Sp. Natural order, MYRTACEÆ. Aboriginal name, BARROUL-GOURRA. Local name, BASTARD BOX.

"The most unsightly, perhaps, of all the Eucalypti in appearance, generally very much decayed at the heart before it attains its full stature. Its timber is, nevertheless, in high repute for great strength and durability; for the poles and shafts of drays and carts, and for the spokes of wheels, it is supposed to have no equal."

The average diameter of the tree is from 24 inches to 48 inches. The average height, from 60 feet to 100 feet.

Specific gravity.

Specific gravity of specimen, 1·115.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions. Length.	Dimensions. Section.	Bearings between Supports.	Breaking Weight, in lbs.
	Ft. In.	In. square.	Feet.	
Breaking weight. 1	5 0	1½	4	3571·3
2	13 7½	1½	1	5510·0
3	1 3	1¼	1	6435·0
4	1 3	1½	1	5730·4

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102·3	- - -	0·08
2204·6	0·05	0·12
3306·9	0·88	0·19
4409·2	- - -	0·23

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.	
6613·8 lbs. - - -	- 0·02 inch.	
8818·4 „ - - -	- 0·03 „	Crushing weight (longitudinal).
Crushing Weight - -	- 9700·2 lbs.	

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6 - -	- 0·06 crushed to pieces.	Crushing weight (transverse).

NEW SOUTH WALES. No. 12. Swamp Mahogany, Camden.

No. 12.—Botanical name, EUCALYPTUS Sp. Natural order, MYRTACEÆ. Aboriginal name, ——. Local name, SWAMP MAHOGANY, CAMDEN.

"A fine species, with handsome foliage, yielding fine timber, but not of such strength and durability as many other kinds."

The average diameter of the tree is from 36 inches to 48 inches. The average height, from 80 feet to 100 feet.

Specific gravity of specimen, 0·864. Specific gravity.

Capt. Fowke's Experiments on Woods.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{5}{8}$	4	2425·0
2	14 0	$1\frac{7}{8}$	12	6061·0
3	14 0	$1\frac{7}{8}$	12	5289·6

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
2204·6	0·97	—

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·03 inch.
4409·2 „	0·05 „
6613·8 „	0·07 „
8818·4 „	0·12 „
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·12
3306·9	0·18
4409·2	0·24
5511·5	0·35
6613·8	0·40
7716·1	0·41
8818·4	0·45

Crushing weight (transverse).

No. 13.—Botanical name, EUCALYPTUS Sp. Natural order, MYRTACEÆ. Aboriginal name, TERRI-BARRI. Local name, ROUGH-LEAVED, ROUGH-BARKED IRON BARK.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

NEW SOUTH WALES.

No. 13. Rough-barked Iron Bark.

"One of the species which yield the strongest and most durable timber; bark very rugged and durable. This tree has been proposed for their emblem by the colonists of New South Wales."

The average diameter of the tree is from 24 inches to 48 inches. The average height, from 80 feet to 100 feet.

Specific gravity of specimen, 1·016.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{7}{8}$	4	4519·4
2	1 3	$1\frac{7}{8}$	1	8154·8
3	1 3	$1\frac{7}{8}$	1	8265·0

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
2204·6	0·03	0·05
3306·9	0·70	0·09
4409·2	1·53	0·11
5511·5	- - -	0·16
6613·8	- - -	0·20
7716·1	- - -	0·27

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
1023·0 lbs. - - - -	0·09 inch.
13227·6 „ - - - -	0·10 „
Crushing Weight - - -	13227·6 lbs.

Crushing weight (longitudinal).

Capt. Fowke's Experiments on Woods.

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·05
	3306·9	0·53
	4409·2	0·57
	5511·5	0·66
	6613·8	0·67
	7716·1	0·69

New South Wales.

No. 14. Hickory.

No. 14.—Botanical name, Tristania Sp. Natural order, ——. Aboriginal name,——. Local name, Hickory.

"A species, apparently differing from No. 1, common at Illawarra, and in high repute for toughness and strength. Collected at Brisbane Water, where it grows on low, moist land, and never attains the dimensions of No. 1, at Illawarra. The latter was found only high up the mountain. Not having found a single specimen of No. 14 in a state of fructification, the question of the identity of the two Nos. seems to be doubtful."

The average diameter of the tree is from 24 inches to 36 inches. The average height, from 80 feet to 120 feet.

Specific gravity.

Specific gravity of specimen, 0·748.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions. Length.	Dimensions. Section.	Bearings between Supports.	Breaking Weight, in lbs.
	Ft. In.	In. square.	Feet.	
Breaking weight. 1	5 0	$1\frac{3}{4}$	4	4188·7
2	1 2	$1\frac{3}{4}$	1	4408·0

SECOND EXPERIMENT, for noting the Deflection.
Dimensions and Bearing as in First Experiment.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102·3	0·02	0·06
2204·6	0·09	0·14
3306·9	0·94	0·21
4409·2	- - -	0·32

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
6613·8 lbs. - - -	0·11 inch.
Crushing Weight - -	7052·8 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6 - - -	- 0·27
3306·9 - - -	- 0·44
5511·5 - - -	- 0·49
7716·1 - - -	- 0·52

Crushing weight (transverse).

NEW SOUTH WALES.

No. 15. Mahogany.

No. 15.—Botanical name, EUCALYPTUS Sp. Natural order, MYRTACEÆ. Aboriginal name, ——. Local name, MAHOGANY.

"A noble timber tree; its wood much prized for its strength and durable qualities. One of the specimens is from a principal rafter of the roof of Parramatta Church, built in 1798. One face of this specimen shows the original surface of the rafter."

The average diameter of the tree is from 30 inches to 70 inches. The average height, from 60 feet to 130 feet.

Specific gravity of specimen, 0·952.

Specific gravity.

Capt. Fowke's Experiments on Woods.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{7}{8}$	4	2976·1
2	1 2	$1\frac{7}{8}$	1	8485·4
3	1 2	$1\frac{7}{8}$	1	7559·7

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
2204·6	0·43	0·04
3306·9	- - -	0·08
4409·2	- - -	0·11
5511·5	- - -	0·15
6613·8	- - -	0·20

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
9920·7 lbs. - - -	- 0·03 inch.
Crushing Weight - -	- 9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
3306·9 - - -	- 0·31
4409·2 - - -	- 0·33
5511·5 - - -	- 0·36
6613·8 - - -	- 0·40
7716·1 - - -	- 0·44
8818·4 - - -	- 0·46

Crushing weight (transverse).

No. 16.—Botanical name, EUCALYPTUS Sp. Natural order, MYRTACEÆ. Aboriginal name,——. Local name, GREY GUM.

Capt. Fowke's Experiments on Woods.

New South Wales.

No. 16 Grey Gum.

"A fine hard wood timber, from the neighbourhood of Windsor."
The average diameter of the tree is from 24 inches to 48 inches.
The average height, from 60 feet to 100 feet.
Specific gravity of specimen, 0·927.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	5 0	$1\frac{7}{8}$	4	3507·3
2	1 3	$1\frac{7}{8}$	1	7163·0

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
2204·6	0·02	—
4409·2	0·44	—

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
2204·6 lbs.	0·02 inch.
4409·2 „	0·04 „
6613·8 „	0·06 „
8818·4 „	0·08 „
9920·7 „	0·12 „
Crushing Weight	9920·7 lbs.

Crushing weight (longitudinal).

Capt. Fowke's Experiments on Woods.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·07
	4409·2	0·44
	6613·8	0·66
	8818·4	0·67

BRITISH GUIANA.

British Guiana.

No. 17. Cabacalli.

No. 17.—Botanical name, ——. Natural order, ——. Aboriginal name, CABACALLI. Local name, CABACALLI.

"From Berbice River; grows tall and straight, and will square from 12 to 18 inches for 40 to 50 feet in length. The wood is heavy and close-grained: it possesses a bitter principle which protects it against the attacks of worms, and renders it durable under water. It must, however, be fastened with copper nails. Of the branches, timbers and knees for every description of craft are made, which are quite as lasting as those of Mora."

Its cost in Guiana, at a wood-cutting establishment, is 1*s.* to 1*s.* 4*d.* per cubic foot.

Specific gravity.

Specific gravity of specimen, 0·893.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions. Length.	Dimensions. Section.	Bearings between Supports.	Breaking Weight, in lbs.
	Ft. In.	In. square.	Feet.	
Breaking weight. 1	1 2½	2	1	7163·0
2	1 2½	2	1	7163·0

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
2204·6	- - -	0·04
3306·9	- - -	0·09
4409·2	- - -	0·12
5511·5	- - -	0·17
6613·8	- - -	0·21

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
9920·7 lbs. - - -	- 0·15
Crushing Weight, - -	- 9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6 - -	- 0·03
3306·9 - -	- 0·06
4409·2 - -	- 0·26
5511·5 - -	- 0·30
6613·8 - -	- 0·36
7716·1 - -	- 0·41
8818·4 - -	- 0·45

Crushing weight (transverse).

BRITISH GUIANA.

No. 18.—Botanical name, MORA EXCELSA. Natural order, ——. Aboriginal name, MORA. Local name, MORA.

No. 18. Mora.

"From Berbice River, the most majestic tree of the forests of Guiana, attains a height of from 100 to 150 feet, and is frequently found 60 feet in height without a branch; when of that length it will square 18 or 20 inches, but is then seldom sound throughout. The wood is extremely tough, close and cross-grained, so that it is difficult to split, which renders it peculiarly adapted for ship-building. The trunk makes admirable keels, timbers, and beams,

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and the branches, having a natural crookedness of growth, are unsurpassed as knees. Were men-of-war ceiled with this wood, little mischief would be occasioned by splinters during action. In most respects it is superior to oak, particularly in its exemption from dry rot. This, as well as Greenheart, ranks as one of the eight first-class woods at Lloyd's for shipbuilding. It is abundant along the rivers of the coast region; it grows luxuriantly on sand reefs and on tracts of barren clay known as "Mora clay." The importance of the Mora in naval architecture is now fully recognized in Great Britain, and a new export trade has been opened to the colony. On the upper Barima this tree is so abundant, and grows to such a size, that the whole British Navy might be reconstructed merely from the trees which line its banks,—a circumstance well worth consideration, for the river being navigable to vessels of 12 feet draught, the craft intended for the transport of the timber might load at the very spot where the trees are cut down. The bark of the Mora is used for tanning; the seeds also are said to be beneficial in cases of diarrhœa. The specimen sent is indifferent."

Cost at wood-cutting establishment in Guiana, 1*s.* to 1*s.* 6*d.* per cubic foot.

Specific gravity.

Specific gravity of specimen, 0·922, water being 1·000.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	2	1	9697·6

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102·3	0·02	—
2204·6	0·05	—
3306·9	0·09	—
4409·2	0·12	—
5511·5	0·13	—
6613·8	0·16	—
7164·9	0·19	—

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre. CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
9920·7 lbs.	0·10 inch.
Crushing Weight	9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·07
3306·9	0·10
4409·2	0·19
5511·5	0·33
6613·8	0·38
8818·4	0·50

Crushing weight (transverse).

No 19.—Botanical name, PIRATINERA GUIANENSIS, AUBL. Natural order, ——. Aboriginal name, BOURRA COURRA PAIRA. Local name, LETTER WOOD, or SNAKE WOOD. BRITISH GUIANA. No. 19. Letter Wood.

"From Berbice River; this tree is *scarce* within several hundred miles of the sea coast, is often from 60 to 70 feet high, and from 2 to 3 feet in diameter. The outer part of the wood is white and very hard; the heart is of great weight, hardness, and solidity; variegates with black spots of different size and figure, which gives rise to its name, "Letter Wood," and "Snake Wood."

It is suceptible of a brilliant polish, but the small size of the mottled part, and its great value even in the colony, limits its use almost entirely to veneering, to picture frames, and to small pieces of furniture.

Cost, 8*d.* per lb.

Specific gravity of specimen, 0·999.

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NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	In.	
Breaking weight. 1	1 0	2	9½	14215·8

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
Deflection. 2204·6	0·02	Nil.
3306·9	0·03	
4409·2	0·05	
5511·5	0·07	
6613·8	0·08	
7164·9	0·09	
7716·1	0·10	

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
13227·6 lbs.	0·03 inch.
Crushing weight (longitudinal). Crushing Weight	14105·6 lbs.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse). 2204·6	0·05
3306·9	0·08
4409·2	0·10
5511·5	0·14
6613·8	0·17
7716·1	0·22
8818·4	0·27

No. 20.—Botanical name, ———. Natural order, ———. Aboriginal name, HOUBABALLI. Local name, HOUBABALLI. No. 20. Houballi.

"A light brownish wood, beautifully variegated with black and brown streaks; easily worked, and makes beautiful furniture and cabinetwork. It may be had from 15 to 20 inches square, and from 40 to 70 feet long. The tree is by no means scarce, but is frequently found hollow in the centre, which often renders it useless."

Price in Guiana, at a wood-cutting establishment, 1*s.* 6*d.* to 2*s.* per cubic foot.

Specific gravity of specimen, 0·810. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	2	1	4518·2

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·08
3306·9	0·13
4409·2	0·26

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·02
4409·2 „	0·04
5511·5 „	0·13
Crushing Weight	5511·5 lbs.

Crushing weight (longitudinal).

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FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·45
	4409·2	0·51
	6613·8	0·55
	8818·4	0·60

British Guiana.

No. 21. Monkey Pot.

No. 21.—Botanical name, LECYTHIS GRANDIFLORA, AUBL. Natural order,——. Aboriginal name, WADADURI. Local name, MONKEY POT.

"This tree is plentiful throughout the colony. It grows tall, straight, and to a large size. The wood is to be had from 15 to 20 feet in length, and from 4 to 6 inches in diameter. It is very close, tough, and elastic, and is in great repute for gig-shafts. The Indians make their arrow-points of this wood. The specimen sent has been injured by water."

Price in Guiana, at a wood-cutting establishment, 1*s.* 6*d.* to 2*s.* per cubic foot.

Specific gravity.

Specific gravity of specimen, 0·941.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
Breaking weight. 1	1 2	2	1	10689·4

SECOND EXPERIMENT, for noting the Deflection.
Dimensions and Bearing as in First Experiment.

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Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·03
3306·9	0·04
4409·2	0·07
5511·5	0·09
6613·8	0·11
7164·9	0·13
7716·1	0·14

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
12125·3 lbs.	0·04 inch.
Crushing Weight	12125·3 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·08
4409·2	0·59
6613·8	0·60
8818·4	0·62

Crushing weight (transverse).

BRITISH GUIANA.

No. 22. Bartaballi.

No. 22.—Botanical name, LUCUMA BOMPLANDII, H. B. Natural order, ——. Aboriginal name, BARTABALLI. Local name, BARTABALLI.

"Is a tree of large size, and plentiful. This wood is white, ather light, splits freely, and is good for staves, chairs, and the inside work of houses. It bears an agreeable fruit."

Specific gravity of specimen, 0·640.

Specific gravity.

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NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	0 14	1¾	1	5289·6

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·05
2204·6	0·10
3306·9	0·15
4409·2	0·20

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·04 inch
4409·2 „	0·06 „
6613·8 „	0·08 „
7716·1 „	1·00 „
8818·4 „	1·04 „
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·35
3306·9	0·42
4409·2	0·47
6613·8	0·51
8818·4	0·55

Crushing weight (transverse).

No. 23.—Botanical name, ——. Natural order, ——. Aboriginal name, COWASSA. Local name, WILD MAMMEE.

"A hard, close-grained wood, of a rich brown colour, prettily waved, and fitted for furniture and cabinetwork."

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
1	Ft. In. 1 2	In. square. 1½	Foot. 1	4363·9

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·07
3306·9	0·19

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
11023·0 lbs. - - -	0·04 inch.
13227·6 „ - - -	0·05 „
Crushing Weight - -	13227·6 lbs.

Crushing weight (longitudinal).

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Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·10
	3306·9	0·18
	4409·2	0·45
	6511·5	0·48
	5613·8	0·51
	7716·1	0·53
	8818·4	0·55

British Guiana.

No. 24. Purple Heart.

No. 24.—Botanical name, Copaifera Pubiflora and Bracteata Benth. Natural order, ——. Aboriginal name, Mariwayana. Local name, Purple Heart.

"Rather a scarce tree in the coast regions, being found chiefly in the mountainous tracts above the cataracts. There are several varieties or species, but all much alike, possessing great strength and durability. Used for mortar beds, being adapted for sustaining the shocks produced by the discharge of artillery."

Price in colony, 1*s.* 6*d.* to 2*s.* per cubic foot.

Specific gravity.

Specific gravity of specimen, 0·679.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
Breaking weight. 1	1 2	2	1	6391·6

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

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Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·02
2204·6	0·06
3306·9	0·09
4409·2	0·12
5511·5	0·16

Deflection.

THIRD EXPERIMENT, for asertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
2204·6 lbs.	0·05 inch.
4409·2 „	0 06 „
6613·8 „	0·08 „
8818·4 „	0·11 „
Crushing Weight	9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·05
4409·2	0·10
6613·8	0·18
8818·4	0·56

Crushing weight (transverse).

BRITISH GUIANA.

No. 25. Brown Ebony.

No. 25.—Botanical name, ——. Natural order, ——. Aboriginal name, WAMARA. Local name, BROWN EBONY.

"A hard, cross-grained wood, not apt to split, and therefore well adapted for ship-building. Sir R. Schomburgh describes it as a scarce tree, attaining a great height; but the only part used is the heart, which is dark brown, and often streaked. Its hardness and weight cause it to be preferred by the Indians for their

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war-clubs. It may be had from 6 to 12 inches square, and from 20 to 40 feet long."

Specific gravity.

Specific gravity of specimen, 1·034.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	2	1	12122·0

Breaking weight.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·01
2204·6	0·06
4409·2	0·08
5511·5	0·09
6613·8	0·10
7164·9	0·13

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
11023·0 lbs.	0·07 inch.
12125·3 „	0·09 „
Crushing Weight	12566·2 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

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Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·06	Crushing weight (transverse).
3306·9	0·10	
4409·2	0·11	
6613·8	0·37	
7716·1	0·45	
8818·4	0·55	

BRITISH GUIANA.

No. 26.—Botanical name, ERYTHRINA CORALLODENDRON (LIN.) Natural order, ——. Aboriginal name, BARACARA. Local name, BARACARA.

No. 26. Baracara.

"From Berbice River. A hard, close, and even-grained wood. The tree produces the red seeds of which necklaces, bracelets, &c. are made."

Specific gravity of specimen, 0·809. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	1 2	2	1	8954·9
2	1 5	2	1	8044·6

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Tarnsverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
1102·3	0·03	0·15
2204·6	0·09	0·19
3306.9	0·12	0·22
4409·2	0·16	0·27
5511·5	0·24	0·34
6613·8	0·30	0·45
7164·9	0·33	—
7716·1	0·36	0·68

Deflection.

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THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·02 inch.
4409·2 „	0·03 „
6613·8 „	0·07 „
8818·4 „	0·10 „
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Crushing weight (transverse).

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·24
3306·9	0·34
4409·2	0·42
5511·5	0·51
6613·8	0·52
7716·1	0·55
8818·4	0·56

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No. 27.—Botanical name, NECTANDRA RODIÆI (Schomb.) Natural order, ——. Aboriginal name, SIPIRI, BIBIRU, Local name, GREENHEART (yellow variety).

No. 27. Greenheart.

"From Masaruni River. This tree is very abundant within 100 miles of the coast region, and its timber, squaring from 18 to 24 inches, may be had without a knot from 60 to 70 feet long. It is a fine, even-grained, hard wood, well adapted for planking vessels, house-frames, wharves, bridges, and other purposes where great strength and durability are required. As it is unsurpassed in resistance to tensile and compressive strains, it is admirable for kelsons and for ship timbers. It ranks as one of the eight first-class woods at Lloyd's for ship-building."

Specific gravity.

Specific gravity of specimen, 1·052.

NOTE.—*The following Weights are reduced from Kilogrammes.*

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FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length	Section.			
	Ft. In.	In. square.	In.		
1	0 11½	2	9½	15428·0	Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	
2204·6	0·02	Deflection.
3306·9	0·03	
4409·2	0·05	
5511·5	0·07	
6613·8	0·08	
7716·1	0·09	

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.	
4409·2	0·03 inch.	
6613·8	0·05 „	
8818·4	0·07 „	
11023·0	0·09 „	
12125·3	0·20 „	
Crushing Weight,	12125·3 lbs.	Crushing weight (longitudinal.)

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·04	Crushing weight (transverse).
3306·9	0·06	
4409·2	0·08	
5511·5	0·10	
6613·8	0·11	

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No. 28. Greenheart.

No. 28.—Botanical name, NECTANDRA RODÆI (Schomb.) Natural order, ——. Aboriginal name, SIPIRI BIBIRU. Local name, GREENHEART (black variety).

"From Masaruni River. This wood is used for the same purposes as the yellow Greenheart, but it is considered even more durable. It is a handsome wood, and takes a high polish. It is distinguished from the common Greenheart only by the colour of the wood, but it is so scarce in proportion to the brown or yellow, that not more than 1 in 20 of trees cut down are found to belong to this variety. This wood is in great request, on account of its well-known durability, being preferred to all others for windmill shafts, spindles, and mill works in general."

Specific gravity.

Specific gravity of specimen, 1·089.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight in lbs.
	Length.	Section.		
	Ft. In.	In. square.	In.	
—	0 11½	2	9½	13224

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·01
4409·2	0·03
5511·5	0·05
6613·8	0·06
7716·1	0·08

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
15432·2 lbs.	0·11 inch.
Crushing Weight	15432·2 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

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Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·05	Crushing weight (transverse).
4409·2	0·38	
6613·8	0·43	
8818·4	0·51	

No. 29.—Botanical name, DIPTERYX ODORATA, (Wills.) Natural order, ——. Aboriginal name, CUAMARA, or TONKA. Local name, TONKA.

BRITISH GUIANA. No. 29. Tonka.

"This tree is not very plentiful in the colony. The timber may be had from 40 to 50 feet long, and 18 to 20 inches square. It is hard, tough, and durable in an eminent degree, and it is said that a piece one inch square, and of a given length, will bear 100 lbs. more weight than any other timber in Guiana of the same dimensions. It is therefore peculiarly adapted for any purpose where resistance to great pressure is desired. It is used for shafts, mill-wheels, and cogs. This tree yields the well-known 'Tonka Bean.'"

Price in colony, 1*s.* 6*d.* to 2*s.* per cubic foot.

Specific gravity of specimen 0·987. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 1 2	In. square. 2	Foot. 1	10469·0	Breaking weight.

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Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·03
2204·6	0·04
3306·9	0·06
4409·2	0·09
5511·5	0·10
6613·8	0·12
7164·9	0·13
7716·1	0·16

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
11023 lbs.	0·11 inch.
Crushing Weight	11463·9 lbs.

Crushing weight (longitudinal).

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0.05
4409·2	0·06
5511·5	0·08
6613·8	0·10
7716·1	0·29
8818·4	0·34

Crushing weight (transversed).

British Guiana.

No. 30. Ducaliballi.

No. 30.—Botanical name, ——. Natural order, ——. Aboriginal name, Ducaliballi. Local name, Ducaliballi.

"This tree is of large size, but not plentiful. The timber may be had 40 feet long, but seldom more than 20 inches in diameter. It is a deep red close-grained wood, more even and compact than

mahogany, and takes a high polish. It is in great repute for turning and cabinetwork. It resembles, or is perhaps identical with, the Brazilian beef-wood."

Capt. Fowke's Experiments on Woods.

Price in colony 2*s.* 6*d.* to 3*s.* per cubic foot.

Specific gravity of specimen, 0·910.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	2	1	9367·0

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·02
3306·9	0·04
4409·2	0·06
5511·5	0·09
6613·8	0·10
7164·9	0·12
7716·1	0·13

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
13227·6 lbs. - - -	- 0·06 inch
Crushing weight - -	- 13227·6 lbs.

Crushing weight (longitudinal).

Capt. Fowke's Experiments on Woods.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transversed).	2204·6	0·07
	4409·2	0·09
	5511·5	0·15
	6613·8	0·23
	7716·1	0·35
	8818·4	0·57

British Guiana.

No. 31. Cartan.

No. 31.—Botanical name, CENTROLOBIUM ROBUSTUM (Mart.) Natural order, ——. Aboriginal name CARTAN. Local name, CARTAN.

"From Demerary River. A very rare wood, of a rich orange colour, like deal in its grain, but much harder and heavier. It reaches a height of 80 to 100 feet, and being easily worked, and of a handsome colour, promises to become of great interest to cabinetmakers."

Specific gravity.

Specific gravity of specimen, 0·703.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	In.	In. square.	Foot.	
Breaking weight. 1	$12\frac{7}{8}$	2	1	4959·0

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·04
2204·6	0·06
3306·9	0·11
4409·2	0·17
5511·5	0·29

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre. CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.	
9920·7 lbs.	0·05 inch.	
Crushing Weight	9920·7 lbs.	Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·08	Crushing weight (transverse).
3306·9	0·26	
4409·2	0·35	
5511·5	0·40	
6613·8	0·43	
7716·1	0·46	
8818·4	0·50	

No. 32.—Botanical name, ——. Natural order, ——. Aboriginal name, KAIEERI-BALLI. Localname, KAIEERI-BALLI. BRITISH GUIANA. No. 32. Kaieeri-balli.

"From Berbice River. An excellent wood for beams, rafters, and plates of houses."

Specific gravity of specimen, 0·870. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 1 5	In. square. 2	Foot. 1	6391·6	Breaking weight.

Capt. Fowke's Experiments on Woods.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Deflection.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·01
2204·6	0·05
3306·9	0·09
4409·2	0·13
5511·5	0·22

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Crushing weight (longitudinal).

Strain applied.	Amount yielded.
8818·4 lbs.	0·05 inch.
Crushing Weight	8818·4 lbs.

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Crushing weight (transverse).

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·14
4409·2	0·28
6613·8	0·38
8818·4	0·50

British Guiana.

No. 33. Buhuradda.

No. 33.—Botanical name, ——. Natural order, ——. Aboriginal name, Buhuradda. Local name, Buhuradda.

"Is very plentiful, and used for similar purposes as the preceding. This specimen is damaged by water."

Specific gravity.

Specific gravity of specimen, 0·814.

NOTE.—*The following Weights are reduced from Kilogrammes.*

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 7	2	1	9477·2

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·05
3306·9	0·07
4409·2	0·10
6511·5	0·13
6613·8	0·17
7164·9	0·22
7716·1	0·24

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·03 inch.
4409·2 „	0·05 „
6613·8 „	0·08 „
8818·4 „	0·09 „
11023·0 „	0·10 „
12125·3 „	0·11 „
Crushing Weight	12125·3 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimension of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·12
6613·8	0·58
8818·4	0·60

Crushing weight (transverse).

Capt. Fowke's Experiments on Woods.

British Guiana.

No. 34. Wallaba.

No. 34.—Botanical name, Eperua falcata Aubl. Natural order, ——. Aboriginal name, Wallaba. Local name, Wallaba.

"From Berbice River. This wood is of a deep red colour, and is hard and heavy, but splits freely and smoothly, and is much used for shingles, staves, palings, posts, house frames, &c. It is impregnated with a resinous oil, which makes it very durable both in and out of water. A roof well shingled with this wood will last more than 40 years. The tree is very abundant throughout the colony, growing generally on the banks of rivers. It may be cut 30 or 40 feet long and 15 to 20 inches square."

Cost in colony, 10*d.* to 1*s.* 6*d.* per cubic foot.

Specific gravity.

Specific gravity of specimen, 1·035.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 5	2	1	5510·0

Breaking weight.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·04
3306·9	0·06
4409·2	0·09
5511·5	0·11

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimension of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
6613·8 lbs.	0·06 inch.
Crushing Weight	6613·8 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·16	Crushing weight (transverse).
3306·9	0·49	

No. 35.—Botanical name, LECYTHIS OLLARIA (Lin.) Natural order, ——. Aboriginal name, KAKARALLI. Local name, KAKARALLI.

BRITISH GUIANA.

No. 35. Kakaralli.

"This wood is very abundant, grows tall and straight, and may be had from 6 to 14 inches square, and 30 to 40 feet long. It is heavy, hard, and close-grained, and more durable than Greenheart in salt water, from its property of resisting the depredations of the sea-worm and barnacle. On this account it is much employed in the construction of wharfs, sluices, &c. It is also used for house frames. The bark is easily stripped off, and consists of numerous layers, which the Indians separate by beating with a stick; when separated they have the appearance of thin satin paper. They are dried in the sun, and used as wrappers for cigars."

Price in colony, 1*s.* to 1*s.* 6*d.* per cubic foot.

Specific gravity of specimen, 1·103.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 1 2	In. square. 2	Foot. 1	9587·4	Breaking weight.

Capt. Fowke's Experiments on Woods.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·04
3306·9	0·07
4409·2	0·10
5511·5	0·14
6613·8	0·17
7164·9	0·20
7716·1	0·25

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·06 inch.
4409·2 „	0·08 „
6613·8 „	0·10 „
8818·4 „	0·12 „
11023·0 „	0·15 „
13227·6 „	0·18 „
Crushing Weight	13227·6 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·08
4409·2	0·20
6613·8	0·34

Crushing weight (transverse).

No. 36.—Botanical name, ——. Natural order, ——. Aboriginal name, SIRUABALLI. Local name, SILVERBALLI (yellow variety).

No. 36. Silverballi.

"This tree grows to a great size, but is then often hollow. It will, however, square sound from 10 to 14 inches, and from 40 to 50 feet long. The wood is lighter than water, and contains a bitter principle which resists the attack of worms, hence it is much used in the colony for the outside planking of vessels and boats. It is also used for masts and booms. There are four varieties or species of this tree, distinguished as Black, Brown, Yellow, and White Silverballi; of these the latter is least esteemed."

Price in colony, from 1*s.* 6*d.* to 2*s.* per cubic foot.

Specific gravity of specimen, 0·546.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 5	2	1	4297·8

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	00·5
3306·9	0·14

Deflection.

THIRD EXPERIMENT for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
7716·1 lbs.	0·08 inch.
Crushing Weight	7716·1 lbs.

Crushing weight (longitudinal).

Capt. Fowke's Experiments on Woods.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·44
	4409·2	0·56
	6613·8	0·59
	8818·4	0·62

British Guiana. No. 37. Crabwood.

No. 37.—Botanical name, XYLOCARPUS CARAPA (Sp.) Natural order, ——. Aboriginal name, ——. Local name, CRABWOOD.

"This tree is plentiful, grows tall and straight, and may be cut from 40 to 60 feet in length, with a square of 14 or 16 inches. The wood is light, and as it takes a high polish, makes excellent furniture. It is also much used for floors, partitions, and doors in the houses of the wealthy. Masts and spars are formed of it, and it is sometimes employed for sugar hogsheads, and even for shingles, as it splits freely and smoothly. There are two varieties, Red and White. The seeds yield 'Crab Oil,' and the bark is useful for tanning, so that this tree ranks among the most useful in the colony."

Specific gravity.

Price in colony, 1*s.* to 1*s.* 6*d.* per cubic foot.
Specific gravity of specimen, 0·603.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
Breaking weight. 1	Ft. In. 1 5	In. square. 2	Foot. 1	5510·0

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·04
2204·6	0·08
3306·9	0·12
4409·2	0·18
5511·5	0·30

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
8818·4 lbs. - - - -	0·05
Crushing Weight - - -	8818·4 lbs.

Crushing weight (longitudinal).

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6 - - -	0·35
4409·2 - - -	0·46
6613·8 - - -	0·50
8818·4 - - -	0·54

Crushing weight (transverse).

British Guiana.

No. 38. White Cedar.

No. 38.—Botanical name, Icica altissima, (Aubl.) Natural order, ——. Aboriginal name, Warracoori. Local name, White Cedar.

"From Berbice River. Grows abundantly in the low grounds. It is a light, aromatic wood, easily worked; it splits freely, and is therefore well fitted for staves. During the American War it was used for sugar hogsheads. It is frequently employed for the frames and inside of work of houses. Oars and paddles are also made of it, and even canoes. The bark in decoction is used for the Indian malady called the "Caribisi sick." This specimen is from a young tree."

Price in colony, 1*s.* to 1*s.* 6*d.* per cubic foot.

Specific gravity of specimen, 0·771.

Specific gravity.

Capt. Fowke's Experiments on Woods.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight in lbs.
	Length.	Section.		
	Ft. In.	In Square.	Foot.	
1	1 2	2	1	7163·0

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·06
3306·9	0·10
4409·2	0·14
5511·5	0·21
6613·8	0·29
7164·9	0·37

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
8818·4 lbs.	0·04 inch.
9920·7 „	0·07 „
Crushing Weight	9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·10
4409·2	0·50
6613·8	0·54
8818·4	0·57

Crushing weight (transverse).

No. 39.—Botanical name, HYMENÆA COURBARIL (Lin.) Natural order, ——. Aboriginal name, SIMERI. Local name, LOCUST TREE. CAPT. FOWKE'S EXPERIMENTS ON WOODS.

"This tree is abundant in the colony, and often attains the height of 60 or 80 feet before it throws out a branch, and has a diameter of 8 to 9 feet. The wood is close-grained, hard, and compact, of a fine brown, streaked with veins, and takes a beautiful polish. As it does not split or warp, it is well adapted for mill timbers and engine beds. A considerable quantity is exported to England to be used as trenails in planking vessels and in beams and planks for fitting up steam engines. The tree yields the gum animi of commerce." BRITISH GUIANA. No. 39. Locust Tree.

Price in colony, from 1*s.* to 1*s.* 6*d.* per cubic foot.

Specific gravity of specimen, 0·707. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 1¾	2	1	6171·2

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·03
2204·6	0·10
3306·9	0·17
4409·2	0·24
5511·5	0·34

Deflection.

Capt. Fowke's Experiments on Woods.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·02 inch.
4409·2 „	0·04 „
6613·8 „	0·06 „
8818·4 „	0·10 „
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·33
4409·2	0·37
6613·8	0·44
8818·4	0·60

Crushing weight (transverse).

British Guiana.

No. 40. Buckati.

No. 40.—Botanical name, ——. Natural order, —— Aboriginal name, BUCKATI. Local name, BUCKATI.

Specific gravity.

"A hard, compact wood, of a rich brownish yellow colour." Specific gravity of specimen, 0·812.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	2	1	7714·0

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection, in decimlas of an inch.
	Specimen 1.
2204·6	0·03
3306·9	0·06
4409·2	0·10
5511·5	0·14
6613·8	0·20
7164·9	0·26

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
9920·7 lbs.	0·07 inch.
Crushing Weight	9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·09
4409·2	0·33
6613·8	0·45
8818·4	0·50

Crushing weight (transverse).

BRITISH GUIANA.

No. 41.—Botanical name,——. Natural order,——. Aboriginal name, SIRABULIBALLI. Local name, SIRABULIBALLI.

No. 41. Sirabuliballi.

"A wood of small size, but very hard and compact, well adapted for framing."

Specific gravity of specimen, 0·838.

Specific gravity.

Capt. Fowke's Experiments on Woods.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 5	2	1	9920·7

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·03
3306·9	0·08
4409·2	0·11
5511·5	0·16
6613·8	0·18
7164·9	0·23
7716·1	0·29
8818·4	0·32
9920·7	0·40

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·01 inch
4409·2 „	0·03 „
6613·8 „	0·04 „
8818·4 „	0·06 „
9920·7 „	0·19 „
Crushing Weight	9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·04	Crushing weight (transverse).
4409·2	0·40	
5511·5	0·46	
6613·8	0·49	
7716·1	0·50	
8818·4	0·52	

JAMAICA.

JAMAICA.

No. 42.—Botanical name, ——. Natural order, ——. Aboriginal name, ——. Local name, BOXWOOD.

No. 42. Boxwood.

"Used for framing."

Specific gravity of specimen, 0·690.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 1 1¾	In. square. 2	Foot. 1	5511·5	Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	
Nil.	Nil.	Deflection.

Capt. Fowke's Experiments on Woods.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
4409·2 lbs.	0·01 inch.
5511·5 „	0·05 „
8818·4 „	0·08 „
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·05
3306·9	0·16
4409·2	0·28
5511·5	0·40
6613·8	0·49
7716·1	0·51
8818·4	0·54

Crushing weight (transverse).

Jamaica.

No. 43. Iron Wood.

No. 43.—Botanical name, ERYTHROXYLON AREOLATUM. Natural order, ——. Aboriginal and Local name, IRON WOOD, or RED WOOD.

"A small tree, 16 or 18 feet high, and 5 or 6 inches in diameter."

Specific gravity.

Specific gravity of specimen, 0·987.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	1¾	1	9369·5

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·02
2204·6	0·07
3306·9	0·09
4409·2	0·13
5511·5	0·16
6613·8	0·21
7164·9	0·34
7716·1	0·38
8818·4	0·44

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
17636·8 lbs. - - - -	0·13 inch.
Crushing Weight - - - -	17636·8 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
4409·2 - - -	0·02
11023·0 - - -	0·08

Crushing weight (transverse).

Capt. Fowke's Experiments on Woods.

Jamaica.

No. 44. Satin Candlewood.

No. 44.—Botanical name, Amyris. Natural order, ——. Aboriginal and Local name, Satin Candlewood.

Specific gravity of specimen, 0·956.

Specific gravity.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	2	1	12232·2

Breaking weight.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transeverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·02
2204·6	0·06
3306·9	0·08
4409·2	0·11
5511·5	0·13
6613·8	0·16
7164·9	0·17
7716·1	0·18
8818·4	0·21
9920·7	0·24
11023·0	0·31
12125·3	0·42

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied	Amount yielded
2204·6 lbs.	0·03 inch.
4409·2 „	0·04 „
6613·8 „	0·05 „
8818·4 „	0·06 „
11023·0 „	0·07 „
Crushing Weight	12562·8 lbs.

Crushing weight (longitudinal.)

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
4409·2	0·11	Crushing weight (transverse.)
5511·5	0·30	
6613·8	0·55	
8818·4	0·58	

JAMAICA.

No. 45. Lance wood.

No. 45.—Botanical name, GUATTERIA VIRGATA. Natural order, ——. Aboriginal and Local name, LANCE WOOD.

"Excellent timber, where strength and elasticity are required; tough."

Specific gravity of specimen, 0·675.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
	Ft. In.	In. square.	Feet.		
1	1 2	$1\frac{7}{8}$	1	6612·0	Breaking weight.
2	1 2	2	1	7714·0	

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.		
	Specimen 1.	Specimen 2.	
1102·3	0·03	—	
2204·6	0·09	0·06	Deflection.
3306·9	0·13	0·10	
4409·2	0·19	0·15	
5511·5	0·34	0·22	
6613·8	- - -	0·30	
7164·9	- - -	0·39	

Capt Fowke's Experiments on Woods.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·04 inch.
4409·2 „	0·05 „
6613·8 „	0·07 „
Crushing Weight	6613·8 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·19
3306·9	0·30
4409·2	0·37
5511·5	0·40
6613·8	0·43
8818·4	0·46

Crushing weight (transverse).

Jamaica.

No. 46. Black Heart Ebony, or West Indian Ebony.

No. 46.—Botanical name, BRYA EBENUS. Natural order, ——. Aboriginal and Local name, BLACK HEART EBONY, or WEST INDIAN EBONY.

"Very hard and ponderous, and susceptible of a very high polish; very common in the savannahs and dry hills."

Specific gravity.

Specific gravity of specimen, 1·193.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	$1\frac{3}{4}$	1	8485·4

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment..

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·03
3306·9	0·05
4409·2	0·09
5511·5	0·12
6613·8	0·17
7716·1	0·22

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
18739·1 lbs.	0·13 inch.

Crushing weight, 18959·5 lbs. (broke violently).

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain, in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
6613·8	0·04
7716·1	0·05
8818·4	0·30

Crushing weight (transverse).

No. 47.—Botanical name, LAURUS CHLOROXYLON. Natural order, ——. Aboriginal and Local name, COGWOOD.

JAMAICA. No. 47. Cogwood.

"The best for mill-framing, cog-wheels; enduring in water."
Specific gravity of specimen, 0·961.

Specific gravity.

Capt. Fowke's Experiments on Woods.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	$1\frac{7}{8}$	1	6942·6

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·03
2204·6	0·09
3306·9	0·10
4409·2	0·13
5511·5	0·21
6613·8	0·26

Deflection.

THIRD EXPERIMENT for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
6613·8 lbs.	0·01 inch.
8818·4 „	0·03 „
11023·0 „	0·05 „
Crushing Weight	12122·0 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·02
3306·9	0·05
4409·2	0·09
5511·5	0·15
6613·8	0·19
7716·1	0·24
8818·4	0·33

Crushing weight (transverse).

No. 48.—Botanical name, ——. Natural order, ——. Aboriginal and Local name, SMALL LEAF.

JAMAICA. No. 48. Small Leaf.

Specific gravity of specimen, 1·169.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
1	Ft. In. 1 1¾	In. square. 1¾	Foot. 1	7934·4

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·10
2204·6	0·13
3306·9	0·17
4409·2	0·23
5511·5	0·28

Deflection.

Capt. Fowke's Experiments on Woods.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

	Strain applied.	Amount yielded.
Crushing weight (longitudinal.)	15432·2 lbs.	0·18 inch.
	Crushing Weight	15432·2 lbs.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse.)	2204·6	0·04
	4409·2	0·07
	6613·8	0·46

Jamaica.

No. 49. Wild Orange.

No. 49.—Botanical name, CITRUS AURANTIUM. Natural order, ——. Aboriginal and Local name, WILD ORANGE. "Used for framing, &c."

Specific gravity.

Specific gravity of specimen, 0·908.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
Breaking weight. 1	—	—	—	—
2	1 $5\frac{1}{8}$	2	1	10141·1

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
3306·9	- - - -	0·03
4409·2	- - - -	0·05
5511·5	- - - -	0·07
6613·8	- - - -	0·11
7164·9	- - - -	0·14
8818·4	- - - -	0·21
9220·7	- - - -	0·29

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
4409·2 lbs. - - -	0·02 inch.
6613·8 „ - - -	0·03 „
8818·4 „ - - -	0·05 „
11023·0 „ - - -	0·06 „
13227·6 „ - - -	0·08 „
Crushing Weight - -	13237·6 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6 - - -	0·09
3306·9 - - -	0·14
4409·2 - - -	0·19
5511·5 - - -	0·31
6613·8 - - -	0·39
7716·1 - - -	0·45
8818·4 - - -	0·48

Crushing weight (transverse).

Capt. Fowke's Experiments on Woods.

Jamaica.

No. 50. Gynip.

Specific gravity.

No. 50.—Botanical name, Melicocca bijuga. Natural order, ——. Aboriginal and Local name, Gynip.

"Originally imported from Surinam; grows commonly in the lowlands to a very large size."

Specific gravity of specimen, 0·934.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 $1\frac{3}{4}$	2	1	6612·0

Breaking weight.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·01
2204·6	0·07
3306·9	0·10
4409·2	0·15
5511·5	0·20

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.			Amount yielded.
4409·2 lbs.	-	-	0·01 inch.
6613·8 „	-	-	0·03 „
7716·1 „	-	-	0·04 „
8818·4 „	-	-	0·07 „
Crushing Weight	-	-	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction. CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·06	Crushing weight (transverse).
3306·9	0·10	
4409·2	0·15	
5511·5	0·19	
6613·8	0·21	
7716·1	0·22	
8818·4	0·49	

No. 51.—Botanical name, CEDRELA ODORATA. Natural order, ——. Aboriginal and Local name, CEDAR. JAMAICA. No. 51. Cedar.

"Rises with a straight stem 70 or 80 feet, and often from 3 to 5 feet diameter; much esteemed for cabinet-ware and wainscoting, it affords most durable planks and shingles, yields a clear and abundant gum, which is said to be fit for shoemaker's use.

Specific gravity of specimen, 0·576. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 1 3	In. square. 2	Foot. 1	3195·8	Breaking weight.

Capt. Fowke's Experiments on Woods.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·10
2204·6	0·26

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
2204·6 lbs.	0·02
3306·9 „	0·04
4409·2 „	0·08
5511·5 „	0·13

Crushing weight (longitudinal).

Crushing Weight - - - 6613·8 lbs.

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·45
3306·9	0·48
4409·2	0·50
5511·5	0·51
6613·8	0·53
7716·1	0·55
8818·4	0·57

Crushing weight (transverse).

Jamaica.

No. 52. Fustic.

No. 52.—Botanical name, Morus tinctoria. Natural, order, ——. Aboriginal name, Fustic. Local name, Fustic.

"A well-known yellow dyewood; but the use of it as a dyewood is, we believe, much discontinued by the more splendid quercitron bark of America. The wood is admirably adapted for the felloes of carriage and cart wheels. Grown in Kingston."

Specific gravity.

Specific gravity of specimen, 0·966.

NOTE.—*The following Weights are reduced from Kilogrammes.*

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 1 $2\frac{7}{8}$	Section. 2	Foot. 1	8595·6	Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	
2204·6	0·05	Deflection.
3306·9	0·08	
4409·2	0·10	
5511·5	0·13	
6613·8	0·17	
7164·9	0·21	
7716·1	0·23	

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.	
12125·3 lbs.	0·06 inch.	
Crushing Weight,	12125·3 lbs.	Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·03	Crushing weight (transverse).
4409·2	0·09	
6613·8	0·28	
8818·4	0·39	

Capt. Fowke's Experiments on Woods.

Jamaica.

No. 53. Prickle Yellow.

No. 53.—Botanical name, XANTHOXYLON CLAVA HERCULIS. Natural order, ——. Aboriginal and Local name, PRICKLE YELLOW.

"For furniture, flooring, inlaying, &c., very common. Said to afford a dye, and to possess medicinal properties."

Specific gravity.

Specific gravity of specimen, 0·691.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 3	2	1	5730·4

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·02
2204·6	0·05
3306·9	0·08
4409·2	0·14
5511·5	0·24

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
4409·2 lbs.	0·03 inch.
5511·5 „	0·04 „
6613·8 „	0·06 „
7716·1 „	0·07 „
8818·4 „	0·09 „
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·28	Crushing weight (transverse).
3306·9	0·52	
4409·2	0·59	
6613·8	0·65	
8818·4	0·66	

JAMAICA.

No. 54.—Botanical name, GUIACUM OFFICINALE. Natural order, ——. Aboriginal or Local name, LIGNUM VITÆ.

No. 54. Lignum Vitæ.

"A well-known hard wood, adapted for rulers, pestles, and mortars, the rollers or wheels of blocks and pullies, yielding the medicinal gum resin, Guiacum. A decoction of the bark is in common use among the natives as a cure for rheumatism. The tree is very common on the south side of the island."

Specific gravity of specimen, 1·170.
Ditto, No. 2, ditto 0·651.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight, when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 $2\frac{7}{8}$	2	1	5511·5
2	1 $4\frac{1}{2}$	2	1	5069·2

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	Specimen 2.
2204·6	0·01	0·07
3306·9	0·05	0·12
4409·2	0·08	0·21

Deflection

Capt. Fowke's Experiments on Woods.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
4409·2 lbs.	0·01
6613·8 „	0·02
8818·4 „	0·04
9920·7 „	0·05
Crushing Weight	9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied in lbs.	Amount yielded, in decimals of an inch.
4409·2	0·01
6613·8	0·02
7716·1	0·05
8818·4	0·06
9920·7	0·26

Crushing weight (transverse).

Jamaica.

No. 55. Wild Tamarind.

No. 55.—Botanical name, ACACIA ARBOREA. Natural order, ——. Aboriginal or Local name, WILD TAMARIND.

Specific gravity.

Specific gravity of specimen, 0·750.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	1¾	1	3526·4

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·12
3306·9	0·14

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
4409·2	0·07
6613·8	0·09
7716·1	0·11
Crushing Weight	8705·8 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·48
4409·2	0·64
6613·8	0·66
8818·4	0·70

Crushing weight (transverse).

No. 56.—Botanical name, QUASSIA EXCELSA. Natural order, ——. Aboriginal or Local name, BITTERWOOD.

JAMAICA. No. 56. Bitterwood.

Used for "lumber generally; never infested with insects."
Specific gravity of specimen, 0·555.

Specific gravity.

Capt. Fowke's Experiments on Woods.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 2	2	1	3746·8

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·17
3306·9	0·44

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
2204·6 lbs.	0·09 inch.
4409·2 „	0·13 „
5511·5 „	0·19 „
Crushing Weight	5511·5 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·51
4409·2	0·57
6613·8	0·60
8818·4	0·63

Crushing weight (transverse).

Capt. Fowke's Experiments on Woods.

Jamaica.

No. 57. — Botanical name, BIGNONIA LONGISSIMA, or TECOMA LONGISSIMA. Natural order, ——. Aboriginal and Local name, FRENCH OAK.

No. 57. French Oak.

"Grows large."

Specific gravity of specimen, 0·774.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
1	Ft. In. 1 4½	In. square. 2	Foot. 1	4408·0

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·02
2204·6	0·14
3306·9	0·26
4409·2	0·44

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
4409·2 lbs.	0·01 inch.
5511·5 „	0·04 „
6613·8 „	0·14 „
Crushing Weight	6613·8 lbs.

Crushing weight (longitudinal).

Capt. Fowke's Experiments on Woods.

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·33
	3306·9	0·41
	4409·2	0·46
	5511·5	0·50
	6613·8	0·54
	7716·1	0·58
	8818·4	0·61

Jamaica.

No. 58. Fiddlewood.

No. 58.—Botanical name, Citharexylum malanocardium. Natural order, ——. Aboriginal and Local name, Fiddlewood.

"Durable. Used for mill framing, carriage wheels, &c. A most useful timber. Said to yield a beautiful yellow or orange for whitewashers' work."

Specific gravity.

Specific gravity of specimen, 0·707.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
Breaking weight. 1	1 2	2	1	5510·0

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
Deflection. 2102·3	0·03
2204·6	0·10
3306·9	0·18
4409·2	0·27

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·02 inch.
4409·2 „	0·04 „
5511·5 „	0·07 „
6613·8 „	0·16 „
Crushing Weight	6613·8 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·36
4409·2	0·61
6613·8	0·67
8818·4	0·69

Crushing weight (transverse).

No. 59.—TERMINALIA LATIFOLIA. Natural order, ——. Aboriginal or Local name, BROADLEAF.

JAMAICA.

No. 59. Broad Leaf

"Used for boards, scantling, shingles, and staves. This tree is often called the 'Almond Tree,' from the almond-shaped nut it bears. The outer coat of this nut (about ¼ inch thick) is a soft, acrid, insipid fruit, of which bats, &c. are very fond, as they constantly carry them about from place to place. The shell is very thick, and the nut very small, possessing a pleasant nutty flavour; grows 60 feet before reaching main branches, and 12 or 16 feet in circumference."

Specific gravity of specimen, 0·771.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
1	Ft. In. 1 2	In. square, 2	Foot. 1	6061·0

Breaking weight.

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SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·03
2204·6	0·09
3306·9	0·14
4409·2	0·22
5511·5	0·35

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
4409·2 lbs.	0·03 inch.
6613·8 „	0·06 „
7716·1 „	0·09 „
Crushing Weight	7716·1 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·16
3306·9	0·45
4409·2	0·51
6613·8	0·55
8818·4	0·60

Crushing weight (transverse).

JAMAICA.

No. 60. Cashaw.

No. 60.—Botanical name, PROSOPIS JULIFLORA. Natural order, ——. Aboriginal name, CASHAW. Local name, CASHAW.

"Adapted for knees of boats and ship-building generally, but it does not stand the iron nails well. Yields an abundant gum, differing little, if at all, from gum arabic; also a useful fibre; a common tree; attains 30 or 40 feet in height, with 3 feet diameter; very hard, much twisted and crooked; sometimes split for shingles, but nail holes must be bored."

Specific gravity.

Specific gravity of specimen, 0·916.

NOTE.—*The following Weights are reduced from Kilogrammes.*

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

FIRST EXPERIMENT for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
—	Ft. In. 1 $2\frac{1}{8}$	In. square. 2	Foot. 1	6391·6	Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	
1102·3	0·01	Deflection.
2204·6	0·06	
3306·9	0·09	
4409·2	0·15	
5511·5	0·20	

THIRD EXPERIMENT for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain appplied.	Amount yielded.	
9920·7 lbs.	0·14	
Crushing Weight	9920·7 lbs.	Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·07	Crushing weight (transverse)
4409·2	0·25	
6613·8	0·35	
8818·4	0·44	

Capt. Fowke's Experiments on Woods.

Jamaica.

No. 61. Bullet Tree.

No. 61.—Botanical name, ACHRAS SIDEROXYLON. Natural order, ——. Aboriginal name, NEESBERRY. Local name, BULLET TREE.

"A very lofty tree. Said to be called "Bully" from its towering above other trees; esteemed as one of the best timber trees."

Specific gravity.

Specific gravity of specimen, 1·046.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
Breaking weight. 1	1 $2\frac{1}{8}$	2	1	9920·7

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
Deflection. 2204·6	0·04
3306·9	0·07
4409·2	0·09
5511·5	0·11
6613·8	0·13
7164·9	0·14
7716·1	0·16
8818·4	0·22
9920·7	0·30

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
Crushing weight (longitudinal. 14329·9 lbs.	0·08 inch.
Crushing Weight	14329·9 lbs.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction. CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·04	Crushing weight (transverse).
4409·2	0·09	
6613·8	0·13	

No. 62.—Botanical name, PODOCARPUS YACCA. Natural order, ——. Aboriginal and Local name, YACCA. JAMAICA. No. 62. Yacca.

"Grows freely in this island, at a moderate elevation from the sea level, and is used for ornamental cabinet purposes."

Specific gravity of specimen, 0·626. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 1 $2\frac{1}{8}$	In. square. 2	Foot. 1	2204·6	Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	
1102·3	0·05	Deflection.

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THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·03
4409·2 „	0·04
5511·5 „	0·05
6613·8 „	0·10
Crushing Weight	6613·8 lbs.

Crushing weight (longitudinal)

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·39
3306·9	0·45
4409·2	0·50
5511·5	0·52
6613·8	0·53
8818·4	0·58

Crushing weight (transverse).

Jamaica.

No. 63 Blue Mahoe.

No. 63.—Botanical name, HIBISCUS TILIACEUS. Natural order, ——. Aboriginal and Local name, BLUE MAHOE.

"Used for cart, carriage, and waggon bodies, inlaying, &c.; much used for furniture; yields strong fibre for cordage."

Specific gravity.

Specific gravity of specimen, 0·536.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 $5\frac{1}{8}$	2	1	4297·0

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.
Dimensions and Bearing as in First Experiment.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Transverse Strain, in lbs.	Deflection in decimals of an inch.
	Specimen 1.
1102·3	0·09
2204·6	0·23
3306·9	0·40

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
8818·4 lbs. - - -	0·11 inch.
Crushing Weight - -	8818·4

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6 - - -	0·60
4409·2 - - -	0·65
6613·8 - - -	0·68
8818·4 - - -	0·70

Crushing weight (transverse).

No. 64. — Botanical name, PRUNUS OCCIDENTALIS. Natural order, ——. Aboriginal and Local name, PRUNE.

JAMAICA.

No. 64. Prune.

"The bark yields an excellent liquor."

Specific gravity of specimen, 0·864.

Specific gravity.

NOTE.— *The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 3	2	1	6613·8

Breaking weight.

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SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·05
3306·9	0·09
4409·2	0·14
5511·5	0·20
6613·8	0·34

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·02 inch.
4409·2 „	0·03 „
6613·8 „	0·04 „
8818·4 „	0·05 „
9920·7 „	0·10 „
Crushing weight	9920·7 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaing the Crushining Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·06
3306·9	0·18
4409·2	0·28
5511·5	0·38
6613·8	0·41
7716·1	0·42
8818·4	0·45

Crushing weight (transverse).

Jamaica.

No. 65. Wild Mahogany.

No. 65.—Botanical name, VAR SWIETANIA MAHOGANI. Natural order, ——. Aboriginal and Local name, WILD MAHOGANY.

"Used for furniture, water wheels, planking of vessels, &c. Its growth dependent on localities."

Specific gravity.

Specific gravity of specimen, 0·921.

NOTE.—*The following Weights are reduced from Kilogrammes.*

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
	Ft. In.	In. square.	Foot.		
1	1 3	2	1	7383·4	Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	
2204·6	0·04	Deflection.
3306·9	0·09	
4409·2	0·12	
5511·5	0·18	
6613·8	0·23	
7164·9	0·28	

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.		Amount yielded.	
4409·2 lbs.	- - -	0·03 inch.	
6613·8 „	- - -	0·05 „	
8818·4 „	- - -	0·07 „	
Crushing Weight	- -	8818·4 lbs.	Crushing weight (longitudinal.)

Capt. Fowke's Experiments on Woods.

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transversed.)	2204·6	0·10
	4409·2	0·52
	6613·8	0·56
	8818·4	0·58

Jamaica.

No. 66. Willow-leaved Bastard Bullet Tree.

No. 66.—Botanical name, Bumelia salicifolia. Natural order, ——. Aboriginal name, Sapota, and Galimeta Wood. Local name, Willow-leaved Bastard Bullet Tree.

"From Fort George pen; extracted from the forest at six miles from the sea coast, and grew in a soil of mould, the substratum rock being porphyritic conglomerate, and sandstone. Said to be good timber wood when not exposed to the weather."

Specific gravity.

Specific gravity of specimen, 0·902.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
Breaking weight. 1	1 5	2	1	6722·2

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

	Transverse Strain, in lbs.	Deflection, in decimals of an inch.
		Specimen 1.
Deflection.	1102·3	0·03
	2204·6	0·06
	3306·9	0·09
	4409·2	0·11
	5511·5	0·14
	6613·8	0·18

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Strain applied.	Amount yielded.
4409·2 lbs.	0·02 inch.
6613·8 „	0·03 „
8818·4 „	0·05 „
11023·0 „	0·11 „
Crushing Weight	11023·0 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·11
4409·2	0·30
6613·8	0·37
8818·4	0·42

Crushing weight (transverse).

JAMAICA.

No. 67.—Botanical name, HYMENÆA COURBARIL. Natural order, ——. Aboriginal and Local name, LOCUST.

No. 67. Locust.

"Boards; house framing; hard and tough; supposed to have been imported. From the roots exude that valuable substance called 'gum animi,' which is said to form an excellent varnish, superior to Chinese lacca. Grows on the plains and mountains round St. Catharine's."

Specific gravity of specimen, 0·675.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight in lbs.
	Length.	Section.		
1	Ft. In. 1 $5\frac{3}{4}$	In. square. 2	Foot. 1	6061·0

Breaking weight.

Capt. Fowke's Experiments on Woods.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Deflection.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·08
3306·9	0·14
4409·2	0·23
5511·5	0·40

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Crushing weight (longitudinal).

Strain applied.	Amount yielded.
4409·2 lbs.	0·03 inch.
6613·8 „	0·05 „
7716·1 „	0·26 „
Crushing Weight	7716·1

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Crushing weight (transverse).

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·38
3306·9	0·41
4409·2	0·45
5511·5	0·51
6613·8	0·54

No. 68.—Botanical name, ——. Natural order, ——. Aboriginal name, BEECH. Local name, BEECH.

Used for "house framing, of large growth."

Specific gravity of specimen 0·843.

No. 68. Beech.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Feet.	
1	1 13¾	2	1	9038·8

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·02
3306.9	0·05
4409·2	0·09
5511·5	0·11
6613·8	0·17
7164·9	0·21
7716·1	0·27
8818·4	0·45

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
8818·4 lbs	0·08 inch.
Crushing Weight	8818·4 lbs.

Crushing weight (longitudinal).

Capt. Fowke's Experiments on Woods.

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·13
	4409·2	0·31
	5511·5	0·37
	6613·8	0·41

Jamaica.

No. 69. Cabbage Bark Tree.

No. 69.—Botanical name, Andira inermis. Natural order, ——. Aboriginal name, ——. Local name, Cabbage Bark Tree.

"Grows to a moderate height; bark used as a vermifuge; its effects are emetic, drastic, purgative, and narcotic; yields a very tough and useful wood."

Specific gravity.

Specific gravity of specimen, 0·945.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
Breaking weight. 1	Ft. In. 1 5¼	In. square. 2	Foot. 1	6722·2

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
Deflection. 2204·6	0·05
3306·9	0·08
4409·2	0·10
5511·5	0·15
6613·8	0·23

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre. CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.	
9920·7 lbs.	0·05 inch.	
Crushing Weight	9920·7 lbs.	Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·08	Crushing weight (transverse).
4409·2	0·34	
6613·8	0·47	
8818·4	0·52	

JAMAICA.

No. 70.—Botanical name, ——. Natural order, ——. Aboriginal and Local name, RED BULLY or BULLET TREE. No. 70. Red Bully, or Bullet Tree.

Specific gravity of specimen, 0·999. Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 1 4	In. square. 2	Foot. 1	5510·0	Breaking weight.

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Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

	Transverse Strain, in lbs.	Deflection, in decimals of an inch.
		Specimen 1.
Deflection.	2204·6	0·06
	3306·9	0·09
	4409·2	0·10
	5511·5	0·18

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

	Strain applied.	Amount yielded.
Crushing weight (longitudinal).	2204·6 lbs.	0·01 inch.
	4409·2 „	0·02 „
	6613·8 „	0·05 „
	8818·4 „	0·06 „
	9920·7 „	0·16 „
	Crushing Weight	9920·7 lbs.

Fourth Experiment, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

	Strain applied, in lbs.	Amount yielded. in decimals of an inch.
Crushing weight (transverse).	2204·6	0·08
	4409·2	0·19
	6613·8	0·34
	8818·4	0·43

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

JAMAICA.

No. 71. Tamarind.

No. 71.—Botanical name, TAMARINDUS OCCIDENTALIS. Natural order, ——. Aboriginal and Local name, TAMARIND.

"Large growth : thrives in lowland savannahs, but best in brick mould districts."

Specific gravity of specimen, 0·870.

Specific gravity.

NOTE.— *The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
—	Ft. In. 1 $4\frac{7}{8}$	In. square. 2	Foot. 1	6722·2

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
2204·6	0·05
3306·9	0·09
4409·2	0·15
5511·5	0·20
6613·8	0·28

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
4409·2 lbs.	0·05 inch.
6613·8 „	0·06 „
8818·4 „	0·09 „
Crushing Weight	9256·8 lbs.

Crushing weight (longitudinal).

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FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

	Strain applied, in lbs.	Amount yielded, in decimals of an inch.
Crushing weight (transverse).	2204·6	0·11
	4409·2	0·35
	6613·8	0·41
	8818·4	0·47

Jamaica. No. 72. Calabash.

No. 72.—Botanical name, CRESCENTIA CUJETE. Natural order, ——. Aboriginal name, ——. Local name, CALABASH.

"Grows common throughout the island, 20 feet and less high, wood light, tough, and pliant, fit for carriage building, &c. The fruit well adapted for many domestic and ornamental purposes."

Specific gravity of specimen, 0·557.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions. Length.	Dimensions. Section.	Bearing between Supports.	Breaking Weight, in lbs.
	Ft. In.	In. square.	Foot.	
Breaking weight. 1	1 5¼	2	1	4518·2

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch. Specimen 1.
Deflection. 1102·3	0·03
2204·6	0·08
3306·9	0·11
4409·2	0·23

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Strain applied,	Amount yielded.
2204·6 lbs.	0·01 inch.
4409·2 „	0·03 „
5511·5 „	0·18 „
Crushing Weight,	5511·5 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
1102·3	0·31
2204·6	0·33
3306·9	0·43
4409·2	0·50
5511·5	0·54
6613·8	0·57
7716·1	0·59
8818·4	0·61

Crushing weight (transverse).

No. 73.—LIGNUM VITÆ. *See* No. 54, Specimen 2.

JAMAICA.

No. 73. Lignum Vitæ.

No. 74.—Botanical name, ——. Natural order, ——. Aboriginal and Local name, YELLOW SANDERS.

Specific gravity of specimen, 0·859.

JAMAICA.

No. 74. Yellow Sanders.

Specific gravity.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
1	Ft. In. 1 4¾	In. square. 2	Foot. 1	9590·0

Breaking weight.

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SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·03
2204·6	0·07
3306·9	0·12
4409·2	0·21

Deflection.

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of specimen, 1 *inch cube.*

Strain applied.	Amount yielded.
2204·6 lbs.	0·03 inch.
4409·2 „	0·05 „
6613·8 „	0·10 „

Crushing weight (longitudinal).

Crushing Weight - - - - 6613·8 lbs.

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·26
4409·2	0·43
6613·8	0·49
8818·4	0·52

Crushing weight (transverse).

Jamaica.

No. 75. Green Mahogany.

No. 75.—Botanical name, SWEITENIA MAHOGANI. Natural order, ——. Aboriginal and Local name, GREEN MAHOGANY.

"For furniture, water wheels, planking of vessels, &c."

Specific gravity.

Specific gravity of specimen, 0·664.

NOTE.—*The following Weights are reduced from Kilogrammes.*

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearing between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
	Ft. In.	In. square.	Foot.		
1	0 16¼	2	1	6061·0	Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	
2204·6	0·07	Deflection.
3306·9	0·16	
4409·2	0·23	
5511·5	0·45	

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.	
2204·6 lbs.	0·04 inch.	
4409·2 „	0·07 „	
6613·8 „	0·10 „	
Crushing Weight,	7716·1 lbs.	Crushing weight (longitudinal.)

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·30	
4409·2	0·43	Crushing weight (transverse).
6613·8	0·49	
8818·4	0·52	

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Jamaica.

No. 76. Black Dogwood or Bitchwood.

No. 76.—Botanical Name, Piscidia Carthageniensis. Natural order, ——. Aboriginal and Local name, Black Dogwood, or Bitchwood.

"A mid-sized tree, grows mostly in the low lands on dry calcereous hills. The bark, especially of the root, intoxicates fish. A tincture has been used as a hynoptic, and has been highly recommended in cases of maniacal excitement. A most useful tree, lasts well in or out of water, and said to make excellent piles for wharves, &c."

Specific gravity.

Specific gravity of specimen, 0·930, water being 1·000.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In squares.	Feet.	
1	16 ¼	2	1	6061·0

Breaking weight.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·03
2204·6	0·08
3306·9	0·11
4409·2	0·23

Deflection.

Third Experiment, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 inch cube.

Strain applied.	Amount yielded.
11023·0 lbs.	0·13 inch.
Crushing Weight	11023·0 lbs.

Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

CAPT. FOWKE'S EXPERIMENTS ON WOODS.

Dimensions of Specimen, 1 inch cube.

Strain applied, in lbs.	Amount yielded, in decimals of an inch.
2204·6	0·07
4409·2	0·17
6613·8	0·33
8818·4	0·70

Crushing weight (transverse).

No. 77.—Botanical name, CITRUS AURANTIUM. Natural order, ——. Aboriginal and Local name, Sweet Orange.

JAMAICA.

No. 77. Sweet Orange.

"Used for inlaying, &c. walking sticks. Very common; but thrives best in brick mould districts."

Specific gravity of specimen, 0·785.

Specific gravity.

NOTE.—*The following weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.
	Length.	Section.		
	Ft. In.	In. square.	Foot.	
1	1 $5\frac{7}{8}$	2	1	4628·4

Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·04
2204·6	0·10
3306·9	0·20
4409·2	0·38

Deflection.

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No. 78.—Botanical name, Piscidia Erythrina. Natural order, ——. Aboriginal and Local name, White Dogwood.

Jamaica.

No. 78. White Dogwood.

"A mid-sized tree, growing mostly in the lowlands on dry calcarous hills. The bark, especially of the root, intoxicates fish."

Specific gravity.

Specific gravity of specimen, 0·943.

Note.—*The following Weights are reduced from Kilogrammes.*

First Experiment, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight in lbs.
	Length.	Section.		
	Ft. In.	In. Square.	Foot.	
1	0 17¾	2	1	9477·2

Breaking weight.

Second Experiment, for noting the Deflection.

Dimensions and Bearing as in First Experiment.

Transverse Strain in lbs.	Deflection, in decimals of an inch.
	Specimen 1.
1102·3	0·02
2204·6	0·06
4409·2	0·12
5511·5	0·16
6613·8	0·23
7164·9	0·26
7716·1	0·30
8818·4	0·39

Deflection.

Jamaica.

No. 79. Timber Sweetwood.

No. 79.—Botanical name, Laurus Borbonia. Natural order, ——. Aboriginal and Local name, Timber Sweetwood.

"For boards, staves, and scantlings—large and abundant on the lower hills."

Specific gravity.

Specific gravity of specimen, 0·973.

NOTE.—*The following Weights are reduced from Kilogrammes.*

FIRST EXPERIMENT, for ascertaining the Breaking Weight when submitted to a Transverse Strain.

No. of Specimen.	Dimensions.		Bearings between Supports.	Breaking Weight, in lbs.	
	Length.	Section.			
1	Ft. In. 17 $\frac{3}{4}$	In. Square. 2	Foot. 1	9149·1	Breaking weight.

SECOND EXPERIMENT, for noting the Deflection.

Dimensions and Bearings as in First Experiment.

Transverse Strain, in lbs.	Deflection, in decimals of an inch.	
	Specimen 1.	
2204·6	0·04	Deflection.
3306·9	0·09	
4409·2	0·13	
5511·5	0·21	
6613·8	0·26	
7164·9	0·30	
7716·1	0·33	
8818·4	0·48	

THIRD EXPERIMENT, for ascertaining the Crushing Strain in the Direction of the Fibre.

Dimensions of Specimen, 1 *inch cube.*

Strain applied.	Amount yielded.	
8818·4 lbs.	0·11 inch.	
9920·7 „	0·14 „	
Crushing Weight	9920·7 lbs.	Crushing weight (longitudinal).

FOURTH EXPERIMENT, for ascertaining the Crushing Strain in a Transverse Direction.

Dimensions of Specimen, 1 *inch cube.*

Strain applied, in lbs.	Amount yielded, in decimals of an inch.	
2204·6	0·05	Crushing weight (transverse).
4409·2	0·20	
8818·4	0·62	

TABLE I.

In the following Table the Woods are arranged in the Order of their Specific Gravity.

No. of Specimen.	Name of Wood.	Colony.	Specific Gravity, Distilled Water being 1·000.	Remarks.
46	Black Heart Ebony	Jamaica	1·193	
7	Box of Illawarra	New South Wales	1·170	
54	Lignum Vitæ	Jamaica	1·170	
48	Small Leaf.	Ditto	1·169	
11	Bastard Box	New South Wales	1·115	
2	Mountain Ash	Ditto	1·110	
35	Kakaralli	Ditto	1·103	
28	Sipiri or Greenheart	British Guiana	1·089	
27	Sipiri or Greenheart	Ditto	1·052	
61	Neesberry Bullet Tree	Jamaica	1·046	
34	Wallaba	British Guiana	1·035	
25	Brown Ebony	Ditto	1·034	
5	Iron Bark	New South Wales	1·032	
13	Broad-leaved Iron Bark	Ditto	1·016	
4	Woolly Butt	Ditto	1·005	
1	Water Gum	Ditto	1·001	
19	Letter Wood	British Guiana	0·999	
70	Red Bully Tree	Jamaica	0·999	
29	Cuamara or Tonka	British Guiana	0·987	
43	Iron Wood	Jamaica	0·987	
79	Sweet Wood	Ditto	0·973	
8	True Box of Camden	New South Wales	0·970	
52	Fustic	Jamaica	0·966	
47	Cog Wood	New South Wales	0·961	
44	Satin Candlewood	Jamaica	0·956	
15	Mahogany	New South Wales	0·952	
69	Bastard Cabbage Bark	Jamaica	0·945	
78	White Dogwood	Ditto	0·943	
21	Monkey Pot	British Guiana	0·941	
50	Gynip	Jamaica	0·934	
76	Black Dogwood	Ditto	0·930	
16	Grey Gum	New South Wales	0·927	
18	Mora	British Guiana	0·922	
65	Wild Mahogany	Jamaica	0·921	
60	Cashaw	Ditto	0·916	
30	Ducaballi	British Guiana	0·910	
49 *a*	Wild Orange	Jamaica	0·908	
66	Bullet Tree (Bastard)	Ditto	0·902	
17	Cabacalli	British Guiana	0·893	
3	Black Butt	New South Wales	0·891	
32	Kaieeri-balli	British Guiana	0·870	
71	Tamarind	Jamaica	0·870	
9	Stringy Bark	New South Wales	0·864	
12	Swamp Mahogany	Ditto	0·864	
64	Prune	Jamaica	0·864	
74	Yellow Sanders	Ditto	0·859	
49	Wild Orange	Ditto	0·850	
6	Blue Gum	New South Wales	0·843	

TABLE I.—*continued.*

No. of Specimen.	Name of Wood.	Colony.	Specific Gravity, Distilled Water being 1·000.	Remarks.
68	Beech	Jamaica	0·843	
41	Sirabuliballi	British Guiana	0·838	
33	Buhuradda	Ditto	0·814	
40	Buckati	Ditto	0.812	
20	Houbaballi	Ditto	0·810	
26	Baracara	Ditto	0·807	
77	Sweet Orange	Jamaica	0·785	
37	French Oak	Ditto	0·774	
38	White Cedar	British Guiana	0·771	
59	Broad Leaf	Jamaica	0·771	
55	Wild Tamarind	Ditto	0·750	
14	Hickory	New South Wales	0·748	
39	Locust Tree	British Guiana	0·707	
58	Fiddle Wood	Jamaica	0·707	
31	Cartan	British Guiana	0·703	
53	Prickle Yellow	Jamaica	0·691	
42	Box-wood	Ditto	0·690	
24	Purple Heart	British Guiana	0·679	
57	Locust Tree	Jamaica	0·675	
45	Lancewood	Ditto	0·675	
75	Green Mahogany	Ditto	0·664	
10	Forest Swamp Oak	New South Wales	0·661	
74	Lignum Vitæ	Jamaica	0·651	
22	Bartaballi	British Guiana	0·640	
52	Yacca	Jamaica	0·626	
47	Crabwood	British Guiana	0·603	
51	Cedar	Jamaica	0·576	
72	Calabash	Ditto	0·557	
66	Bitterwood	Ditto	0·555	
66	Silverballi	British Guiana	0·546	
63	Blue Mahoe	Jamaica	0·536	

TABLE II.—Breaking Weights.

In this Table the Woods are arranged according to their Value in the First Series of Experiments.

No. of Specimen.	Name of Wood.	Colony.	Breaking Weight reduced to 12 in. by 2 in. sq.	Value of S. in lbs.	Remarks.
			lbs.		
43	Iron Wood	Jamaica	14991·2	5624·0	
7	Box of Illawarra	New South Wales	13831·6	5186·6	
46	Black Heart Ebony	Jamaica	13580·3	5094·4	
48	Small Leaf	Ditto	12698·6	4761·9	
44	Satin Candlewood	Ditto	12235·5	4587·7	
27	Sipiri or Greenheart	British Guiana	12215·6	4580·0	Yellow variety.
25	Wamara or Brown Ebony.	Ditto	12125·3	4546·0	
23	Wild Mammee	Ditto	11640·2	4365·1	
11	Bastard Box	New South Wales	11450·6	4294·5	
19	Letter Wood	British Guiana	11256·6	4221·8	
5	Iron Bark	New South Wales	10870·8	4068·0	
21	Monkey Pot	British Guiana	10692·3	4009·0	
28	Sipiri or Greenheart	Ditto	10471·8	3926·3	Black variety.
29	Cuamara or Tonka	Ditto	10471·8	3926·3	
49	Wild Orange	Jamaica	10141·1	3802·9	From Metcalf Parish.
13	Broad-leaf Iron Bark	New South Wales	10004·4	3752·2	
41	Sirabuliballi	British Guiana	9920·7	3719·1	
61	Neesberry Bullet Tree	Jamaica	9920·7	3719·1	
2	Mountain Ash	New South Wales	9863·3	3699·3	
18	Mora	British Guiana	9700·2	3637·5	
35	Kakaralli	New South Wales	9590·0	3596·0	
74	Yellow Sanders	Jamaica	9590·0	3596·0	
78	White Dogwood	Ditto	9479·7	3553·8	
33	Buhuradda	British Guiana	9479·7	3553·8	
30	Ducaballi	Ditto	9369·5	3511·9	
79	Sweet Wood	Jamaica	9149·1	3430·3	
68	Beech	Ditto	9038·8	3389·0	
15	Mahogany	New South Wales	8994·7	3373·0	
3	Black Butt	Ditto	8741·2	3278·2	
52	Fustic	Jamaica	8597·9	3223·1	
47	Cog Wood	Ditto	8542·8	3205·4	
26	Baracara	British Guiana	8499·7	3189·2	
22	Bartaballi	Ditto	8465·6	3174·6	
12	Swamp Mahogany	New South Wales	8281·6	3101·8	
16	Grey Gum	Ditto	7828·5	2936·5	
14	Hickory	Ditto	7795·4	2923·3	
1	Water Gum	Ditto	7760·1	2910·0	
40	Buckati	British Guiana	7716·1	2892·4	
45	Lance Wood	Jamaica	7716·1	2892·4	

TABLE II.—*continued.*

No. of Specimen.	Name of Wood.	Colony.	Breaking Weight reduced to 12 in. by 2 in. sq.	Value of S. in lbs.	Remarks.
			lbs.		
65	Wild Mahogany	Jamaica	7385·4	2768·9	
17	Cabacalli	British Guiana	7167·1	2687·4	
38	White Cedar	Ditto	7167·1	2687·4	
6	Blue Gum	New South Wales	7167·1	2687·4	
69	Bastard Cabbage Bark	Jamaica	6724·0	2519·8	
71	Tamarind	Ditto	6724·0	2519·8	
66	Bastard Bullet Tree	Ditto	6724·0	2519·8	
64	Prune	Ditto	6613·8	2480·1	
50	Gynip	Ditto	6613·8	2480·1	
24	Purple Heart	British Guiana	6393·3	2403·0	
60	Cashaw	Jamaica	6393·3	2403·0	
32	Kaieeri-balli	British Guiana	6393·3	2403·0	
4	Woolly Butt	New South Wales	6272·0	2352·3	
10	Forest Swamp Oak	Ditto	6214·6	2330·2	
39	Locust Tree	British Guiana	6172·9	2314·8	
59	Broad Leaf	Jamaica	6062·7	2272·9	
76	Black Dogwood	Ditto	6062·7	2272·9	
67	Locust Tree	Ditto	6062·7	2272·9	
75	Green Mahogany	Ditto	6062·7	2272·9	
9	Stringy Bark	New South Wales	5795·9	2173·7	
53	Prickle Yellow	Jamaica	5731·9	2149·4	
55	Wild Tamarind	Ditto	5643·7	2116·4	
58	Fiddle Wood	Ditto	5511·5	2065·7	
42	Box Wood	Ditto	5511·5	2065·7	
34	Wallaba	British Guiana	5511·5	2065·7	
37	Crabwood	Ditto	5511·5	2065·7	
54	Lignum Vitæ	Jamaica	5511·5	2065·7	
70	Red Bully Tree	Ditto	5511·5	2065·7	
8	True Box of Camden	New South Wales	5443·1	2041·4	
31	Car.an	British Guiana	4960·3	1858·4	
20	Houbaballi	Ditto	4737·7	1776·9	
77	Sweet Orange	Jamaica	4629·7	1735·0	
72	Calabash	Ditto	4518·2	1694·0	
49	Wild Orange	Ditto	4409·2	1653·4	From St. Catherine's Parish.
57	French Oak	Ditto	4409·2	1653·4	
36	Siruaballi	British Guiana	4299·0	1611·5	
63	Blue Mahoe	Jamaica	4299·0	1611·5	
56	Bitter Wood	Ditto	3747·8	1404·3	
51	Cedar	Ditto	3196·7	1199·3	
62	Yacca	Ditto	2204·6	826·7	

TABLE III.—Crushing Strains.

In this Table the Woods are arranged according to their Value in the Third Series of Experiments.

No. of Specimen.	Name of Wood.	Colony.	Crushing Weight, applied in Direction of Fibre. Dimensions, one inch cube.	Remarks.
			lbs.	
46	Black Heart Ebony .	Jamaica . .	18959·5	
43	Iron Wood or Red Wood.	Ditto . .	17636·8	
28	Sipiri Bibiru, or Greenheart.	British Guiana .	15432·2	Black variety.
48	Small Leaf . .	Ditto . .	15432·2	
61	Neesberry Bullet Tree	Ditto . .	14329·9	
19	Letter Wood or Snake Wood.	Ditto . .	14105·6	
23	Wild Mammee . .	Ditto . .	13227·6	
30	Ducaballi . .	Ditto . .	13227·6	
13	Rough-leaved, Rough-barked Iron Bark.	New South Wales .	13227·6	
35	Kakaralli . .	British Guiana .	13227·6	
49	Wild Orange.	Jamaica . .	13227·6	From Metcalf Parish.
25	Wamara or Brown Ebony.	British Guiana .	12566·2	
44	Satin Candlewood .	Jamaica . .	12562·8	
33	Buhuradda . .	British Guiana .	12125·3	
21	Monkey Pot . . .	Ditto . .	12125·3	
47	Cog Wood . . .	Jamaica . .	12122·0	
27	Sipiri or Greenheart	British Guiana .	12125·3	Yellow vearity.
52	Fustic	Jamaica . .	12125·3	
29	Cuamara or Tonka .	British Guiana .	11463·9	
76	Black Dogwood . .	Jamaica . .	11023·0	
66	Willow-leaved Bastard Bullet Tree.	Jamaica . .	11023·0	
1	Water Gum . .	New South Wales .	11020·0	
3	Black Butt . .	Ditto .	11020·0	
2	Mountain Ash .	Ditto .	11020·0	
38	White Cedar . .	British Guiana .	9920·7	
40	Buckati . . .	Ditto . .	9920·7	
41	Sirabuliballi . .	Ditto . .	9920·7	
79	Sweet Wood . .	Jamaica . .	9920·7	
54	Lignum Vitæ . .	Ditto . .	9920·7	
5	Iron Bark . .	New South Wales .	9920·7	
60	Cashaw . . .	Jamaica . .	9920·7	
64	Prune . . .	Ditto . .	9920·7	
69	Bastard Cabbage Bark Tree.	Ditto . .	9920·7	
70	Red Bully Tree .	Ditto . .	9920·7	
7	Box of Illawarra .	New South Wales .	9920·7	
16	Grey Gum . .	Ditto . .	9920·7	

TABLE III.—*continued.*

No. of Specimen.	Name of Wood.	Colony.	Crushing Weight, applied in Direction of Fibre. Dimensions, one inch cube.	Remarks.
			lbs.	
24	Purple Heart	British Guiana	9920·7	
15	Mahogany	New South Wales	9920·7	
17	Cabacalli	British Guiana	9920·7	
18	Mora	Ditto	9920·7	
31	Cartan	Ditto	9920·7	
11	Bastard Box	New South Wales	9700·2	
71	Tamarind	Jamaica	9256·8	
8	True Box of Camden	New South Wales	8818·0	
6	Blue Gum of Camden	Ditto	8818·4	
12	Swamp Mahogany	Ditto	8818·4	
9	Stringy Bark, Camden	Ditto	8818·4	
22	Bartaballi	British Guiana	8818·4	
26	Baracara	Ditto	8818·4	
32	Kaieri-balli	Ditto	8818·4	
39	Simeri or Locust Tree	Ditto	8818·4	
37	Crab Wood	Ditto	8818·4	
42	Box Wood	Jamaica	8818·4	
50	Gynip	Ditto	8818·4	
53	Prickle Yellow	Ditto	8818·4	
68	Beech	Ditto	8818·4	
63	Blue Mahoe	Ditto	8818·4	
65	Wild Mahogany	Ditto	8818·4	
55	Wild Tamarind	Ditto	8705·8	
36	Siruballi	British Guiana	7716·1	
75	Green Mahogany	Jamaica	7716·1	
67	Locust	Ditto	7716·1	
59	Broad Leaf	Ditto	7716·1	
4	Woolly Butt	New South Wales	——	
14	Hickory	Ditto	7052·8	
34	Wallaba	British Guiana	6613·8	
45	Lance Wood	Jamaica	6613·8	
51	Cedar	Ditto	6613·8	
57	French Oak	Ditto	6613·8	
58	Fiddle Wood	Ditto	6613·8	
62	Yacca	Ditto	6613·8	
74	Yellow Sanders	Ditto	6613·8	
72	Calabash	Ditto	5511·5	
10	Forest Swamp Oak	New South Wales	5511·5	
20	Houbaballi	British Guiana	5511·5	
56	Bitter Wood	Jamaica	5511·5	

TABLE IV.

In this Table the Woods are placed according to their Value in the Fourth Series of Experiments.

No. of Specimen.	Name of Wood.	Colony.	Specimens, 1 in. square. Decimals of an inch.	Remarks.
54	Lignum Vitæ	Jamaica	0·01	
43	Iron Wood or Red Wood.	Ditto	0·02	
46	Black Heart Ebony	Ditto	0·02	
29	Cuamara or Tonka	British Guiana	0·06	
48	Small Leaf	Jamaica	0·07	
27	Sipiri or Greenheart	British Guiana	0·08	
30	Ducaballi	Ditto	0·09	
47	Cog Wood	Jamaica	0·09	
61	Neesberry Bullet Tree	Ditto	0·09	
52	Fustic	Ditto	0·09	
24	Purple Heart	British Guiana	0·10	
19	Letter Wood or Snake Wood.	Ditto	0·10	
2	Mountain Ash	New South Wales	0·12	
25	Wamara or Brown Ebony.	British Guiana	0·11	
44	Satin Candlewood	Jamaica	0·11	
50	Gynip	Ditto	0·15	
76	Black Dogwood	Ditto	0·17	
1	Water Gum	New South Wales	0·18	
70	Red Bully Tree	Jamaica	0·19	
18	Mora	British Guiana	0·19	
49	Wild Orange	Jamaica	0·19	
79	Sweet Wood	Ditto	0·20	
35	Kakaralli	British Guiana	0·20	
4	Woolly Butt	New South Wales	0·21	
60	Cashaw	Jamaica	0·25	
17	Cabacalli	British Guiana	0·26	
6	Blue Gum of Camden	New South Wales	0·26	
42	Box Wood	Jamaica	0·28	
64	Prune	Ditto	0·28	
32	Kaieri-balli	British Guiana	0·28	
66	Willow-leaved Bastard Bullet Tree.	Jamaica	0·30	
68	Beech	Ditto	0·31	
40	Buckati	British Guiana	0·33	
15	Mahogany	New South Wales	0·33	
69	Bastard Cabbage Bark Tree.	Jamaica	0·34	
71	Tamarind	Ditto	0·35	
31	Cartan	British Guiana	0·35	
10	Forest Swamp Oak	New South Wales	0·35	
45	Lance Wood	Jamaica	0·37	
39	Simeri or Forest Tree	British Guiana	0·37	
31	Sirabuliballi	Ditto	0·40	
26	Baracara	Ditto	0·42	

TABLE IV.—*continued.*

No. of Specimen.	Name of Wood.	Colony.	Specimens, 1 in. square. Decimals of an inch.	Remarks.
74	Yellow Sanders	Jamaica	0·43	
75	Green Mahogany	Ditto	0·43	
16	Grey Gum	New South Wales	0·44	
67	Locust	Jamaica	0·45	
23	Wild Mammee	British Guiana	0·45	
57	French Oak	Jamaica	0·46	
37	Crab Wood	British Guiana	0·46	
22	Bartaballi	Ditto	0·47	
14	Hickory	New South Wales	0·47	
8	True Box of Camden	Ditto	0·50	
51	Cedar	Jamaica	0·50	
72	Calabash	Ditto	0·50	
62	Yacca	Ditto	0·50	
38	White Cedar	British Guiana	0·50	
59	Broad Leaf	Jamaica	0·51	
20	Houbaballi	British Guiana	0·51	
65	Wild Mahogany	Jamaica	0·52	
5	Iron Bark	New South Wales	0·52	
9	Stringy Bark of Camden.	Ditto	0·52	
36	Siruballi	British Guiana	0·56	
33	Buhuradda	Ditto	0·56	
3	Black Butt	New South Wales	0·56	
56	Bitterwood	Jamaica	0·57	
13	Rough-leaved, Rough-barked Iron Bark.	Ditto	0·57	
21	Monkey Pot	British Guiana	0·59	
53	Prickle Yellow	Jamaica	0·59	
58	Fiddlewood	Ditto	0·61	
63	Blue Mahoe	Ditto	0·65	
55	Wild Tamarind	Ditto	0·64	
7	Box of Illawarra	New South Wales	- -	Fracture at 2000.
11	Bastard Box	Ditto	- -	Ditto 1800.
34	Wallaba	British Guiana	- -	49 at 1500.

TABLE V.

The Ration of the Breaking Weight to the Specific Gravity of each Wood.

No. of Specimen.	Name of Wood.	Breaking Weight divided by Specific Gravity.	Remarks.
43	Iron Wood	15·188	
22	Bartaballi	13·228	
44	Satin Candle Wood	12·782	
41	Sizabuliballi	11·838	
7	Box of Illawarra	11·821	
25	Brown Ebony	11·726	
33	Buhuradda	11·645	
27	Sipiri or Green Heart	11·611	
45	Lance Wood	11·431	
46	Black Heart Ebony	11·383	
21	Monkey Pot	11·362	
49	Wild Orange	11·278	
19	Letter Wood	11·267	
48	Small Leaf	10·862	
68	Beech	10·722	
29	Cuamara, or Touka	10·609	
5	Iron Bark	10·533	
26	Baracara	10·532	
18	Mora	10·520	
14	Hickory	10·421	
30	Ducaballi	10·296	
11	Bastard Box	10·269	
78	White Dogwood	10·052	
13	Rough-leaved Iron Bark	9·846	
3	Black Butt	9·810	
28	Sipiri or Green Heart	9·615	
12	Swamp Mahogany	9·585	
40	Buckati	9·502	
61	Bullet Tree	9·483	
15	Mahogany	9·448	
24	Purple Heart	9·415	
79	Timber Sweet Wood	9·402	
10	Forest Swamp Oak	9·401	
38	White Cedar	9·295	
37	Crab Wood	9·140	
75	Green Mahogany	9·124	
67	Locust	8·981	
52	Fustic	8·900	
47	Cog Wood	8·889	
2	Mountain Ash	8·885	
59	Locust Tree	8·731	
6	Blue Gum	8·501	
16	Grey Gum	8·444	
53	Prickle Yellow	8·290	
54	Lignum Vitæ	8·210	
72	Calabash	8·111	
17	Cabacalli	8·026	

TABLE V.—*continued.*

No. of Specimen.	Name of Wood.	Breaking Weight divided by Specific Gravity.	Remarks.
63	Blue Mahoe	8·020	
65	Wild Mahogany	8·019	
42	Box Wood	7·987	
36	Silverballi	7·873	
59	Broad Leaf	7·863	
58	Fiddle Wood	7·794	
74	Yellow Sanders	7·790	
1	Water Gum	7·752	
71	Tamarind	7·728	
64	Prune	7·654	
55	Wild Tamarind	7·524	
66	Bastard Bullet Tree	6·454	
32	Kaieerí-bulli	7·348	
69	Bastard Cabbage Bark	7·115	
50	Gynip	7·081	
31	Cartau	7·055	
60	Cashan	6·979	
56	Bitter Wood	6·752	
9	Stringy Bark	6·708	
76	Black Dogwood	6·519	
4	Woolly Butt	6·240	
77	Sweet Orange	5·904	
20	Houbaballi	5·849	
57	French Oak	5·694	
8	True Box of Camden	5·611	
51	Cedar	5·549	
70	Red Bully Tree	5·518	
34	Wallaba	5·325	
49	Wild Orange	5·010	
62	Yacca	3·521	

No. 73. Botanical name, Guiacum officinale, *see* No. 54, Specimen 2.

Capt. Fowke's Experiments on Woods.

Index of Woods tested in foregoing Experiments.

No. of Specimen.	Name of Wood.	Colony.
1	Water Gum	New South Wales.
2	Mountain Ash	Ditto.
3	Black Butt	Ditto.
4	Woolly Butt	Ditto.
5	Iron Bark	Ditto.
6	Blue Gum	Ditto.
7	Box of Illawarra	Ditto.
8	True Box of Camden	Ditto.
9	Stringy Bark	Ditto.
10	Forest Swamp Oak	Ditto.
11	Bastard Box	Ditto.
12	Swamp Mahogany	Ditto.
13	Broad-leaved Iron Bark	Ditto.
14	Hickory	Ditto.
15	Mahogany	Ditto.
16	Grey Gum	Ditto.
17	Cabacalli	British Guiana.
18	Mora	Ditto.
19	Letter Wood	Ditto.
20	Houbaballi	Ditto.
21	Monkey Pot	Ditto.
22	Baitiballi	Ditto.
23	Wild Mammee	Ditto.
24	Purple Heart	Ditto.
25	Brown Ebony	Ditto.
26	Baracuia	Ditto.
27	Sipiri, or Green Heart	Ditto.
28	Sipiri, or Green Heart	Ditto.
29	Cuamara, or Touka	Ditto.
30	Ducaballi	Ditto.
31	Cartan	Ditto.
32	Kaieeri-bulli	Ditto.
33	Bulmradda	Ditto.
34	Wallaba	Ditto.
35	Kakaralli	New South Wales.
36	Silverballi	British Guiana.
37	Crab Wood	Ditto.
38	White Cedar	Ditto.
39	Locust Tree	Ditto.
40	Buckati	Ditto.
41	Sirabuliballi	Ditto.
42	Box Wood	Jamaica.
43	Iron Wood	Ditto.
44	Satin Candlewood	Ditto.
45	Lancewood	Ditto.
46	Black Heart Ebony	Ditto.
47	Cog Wood	Ditto.
48	Small Leaf	Ditto.
49	Wild Orange	Ditto.
50	Gynip	Ditto.
51	Cedar	Ditto.
52	Fustic	Ditto.

No. of Specimen.	Name of Wood.	Colony.
53	Prickle Yellow	Jamaica.
54	Lignum Vitæ	Ditto.
55	Wild Tamarind	Ditto.
56	Bitterwood	Ditto.
57	French Oak	Ditto.
58	Fiddle Wood	Ditto.
59	Broad Leaf	Ditto.
60	Cashaw	Ditto.
61	Bullet Tree	Ditto.
62	Yacca	Ditto.
63	Blue Mahoe	Ditto.
64	Prune	Ditto.
65	Wild Mahogany	Ditto.
66	Bastard Bullet Tree	Ditto.
67	Locust	Ditto.
68	Beech	Ditto.
69	Cabbage Bark Tree	Ditto.
70	Red Bully Tree	Ditto.
71	Tamarind	Ditto.
72	Calabash	Ditto.
73	Lignum Vitæ	Ditto.
74	Yellow Sanders	Ditto.
75	Mahogany	Ditto.
76	Black Dogwood	Ditto.
77	Sweet Orange	Ditto.
78	White Dogwood	Ditto.
79	Timber Sweetwood	Ditto.

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